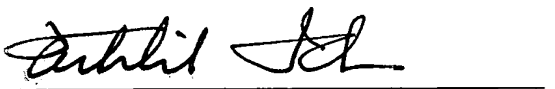
I, Tadahiko Itoh, a Patent Attorney of Tokyo, Japan having my office at 32nd Floor, Yebisu Garden Place Tower, 20-3 Ebisu 4-Chome, Shibuya-Ku, Tokyo 150-6032, Japan do solemnly and sincerely declare that I am the translator of the attached English language translation and certify that the attached English language translation is a correct, true and faithful translation of PCT Application No. PCT/JP99/04075 to the best of my knowledge and belief.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.



Tadahiko ITOH
Patent Attorney
ITOH International Patent Office
32nd Floor,
Yebisu Garden Place Tower,
20-3 Ebisu 4-Chome, Shibuya-Ku,
Tokyo 150-6032, Japan

APR. 26. 2005

PCT REQUEST

99806 PCT

Original (for **SUBMISSION**) - printed on 22. 07 1999 19:07:19 PM

0	**For receiving Office use only**	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	**Form - PCT/RO/101 PCT Request**	
0-4-1	Prepared using	PCT-EASY Version 2.84 (updated 01.06.1999)
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	Japanese Patent Office (RO/JP)
0-7	**Applicant's or agent's file reference**	99806 PCT
I	**Title of invention**	CONNECTION DATA CHANGE MEHOD AND DEVICE, AND SWITCHING UNIT
II	**Applicant**	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	FUJITSU LIMITED
II-5	Address:	1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588 Japan
II-6	State of nationality	JP
II-7	State of residence	JP

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III-1	**Applicant and/or inventor**	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	YAMADA, Hiroshi
III-1-5	Address:	c/o FUJITSU KYUSHU COMMUNICATION SYSTEMS LIMITED, 2-1, Momochihama 2-chome, Sawara-ku, Fukuoka-shi, Fukuoka 814-8588 Japan
III-1-6	State of nationality	JP
III-1-7	State of residence	JP
IV-1	**Agent or common representative; or address for correspondence** The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name (LAST, First)	ITOH, Tadahiko
IV-1-2	Address:	32nd Floor, Yebisu Garden Place Tower, 20-3, Ebisu 4-chome, Shibuya-ku, Tokyo 150-6032 Japan
IV-1-3	Telephone No.	03-5424-2511
IV-1-4	Facsimile No.	03-5424-2525
V	**Designation of States**	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	--
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	JP US
V-5	**Precautionary Designation Statement** In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	

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V-6	Exclusion(s) from precautionary designations	NONE	
VI	Priority claim	NONE	
VII-1	International Searching Authority Chosen	Japanese Patent Office (ISA/JP)	
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	4	–
VIII-2	Description	21	–
VIII-3	Claims	3	–
VIII-4	Abstract	1	99806. txt
VIII-5	Drawings	27	–
VIII-7	TOTAL	56	
	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	–
VIII-9	Separate signed power of attorney	✓	–
VIII-10	Copy of general power of attorney	✓	–
VIII-16	PCT-EASY diskette	–	diskette
VIII-17	Other (specified):	Revenue stamps of transmittal fee for receiving office	–
VIII-17	Other (specified):	Submission of certificate of payment for international fee	–
VIII-18	Figure of the drawings which should accompany the abstract		
VIII-19	Language of filing of the International application	JAPANESE	
IX-1	Signature of applicant or agent		
IX-1-1	Name (LAST, First)	ITOH, Tadahiko (SEAL)	

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10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/JP
10-6	Transmittal of search copy delayed until search fee is paid	

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II-1	**Date of receipt of the record copy by the International Bureau**	

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PCT (ANNEX - FEE CALCULATION SHEET)

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(This sheet is not part of and does not count as a sheet of the international application)

0 0-1	For receiving Office use only International Application No.	
0-2	Date stamp of the receiving Office	

0-4	Form - PCT/RO/101 (Annex) PCT Fee Calculation Sheet Prepared using				
0-4-1			PCT-EASY Version 2.84 (updated 01.06.1999)		
0-9	Applicant's or agent's file reference		99806 PCT		
2	Applicant		FUJITSU LIMITED		
12	Calculation of prescribed fees		fee amount/multiplier	total amounts (JPY)	
12-1	Transmittal fee	T	⇨	18,000	
12-2	Search fee	S	⇨	77,000	
12-3	International fee Basic fee (first 30 sheets)	b1	54,800		
12-4	Remaining sheets		26		
12-5	Additional amount	(X)	1,300		
12-6	Total additional amount	b2	33,800		
12-7	b1 + b2 =	B	88,600		
12-8	Designation fees Number of designations contained in international application		2		
12-9	Number of designation fees payable (maximum 8)		2		
12-10	Amount of designation fee	(X)	12,600		
12-11	Total designation fees	D	25,200		
12-12	PCT-EASY fee reduction	R	-16,900		
12-13	Total International fee (B+D-R)	I	⇨	96,900	
12-17	TOTAL FEES PAYABLE (T+S+I+P)		⇨	191,900	
12-19	Mode of payment		Transmittal fee: revenue stamps Search fee: bank draft International fee: bank draft Priority document fee:		

VALIDATION LOG AND REMARKS

13-2-2	Validation messages States	Green? More designations could be made. Please verify.
13-2-3	Validation messages Names	Green? Applicant 1.:Telephone No. missing

PCT (ANNEX - FEE CALCULATION SHEET) 99806 PCT

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		Green? Applicant 1.:Facsimile No. missing
13-2-4	Validation messages Priority	Green? No priority of an earlier application has been claimed. Please verify
13-2-6	Validation messages Contents	Green? Figure of the drawings which should accompany the abstract not specified. Please verify.
		Green? Reference number for attached copy of general power of attorney not indicated.
13-2-10	Validation messages For receiving Office/International Bureau use only	Green? PCT-EASY used to prepare this application operates on the Windows of a version other than the English version or a Western European language version. Please compare the application and electronic data carefully with respect to the characters other than the ASCII characters.

DESCRIPTION

CONNECTION DATA CHANGE METHOD AND DEVICE, AND SWITCHING UNIT

TECHNICAL FIELD

The present invention relates to connection data change methods and devices, and switching units, and more particularly to a connection data change method and device, and a switching unit for changing connection data for a node constituting a network.

BACKGROUND ART

Conventionally, a connection between nodes (switching units) constituting an ATM (Asynchronous Transfer Mode) network or a packet switching network is set up by a method such as PVC (Permanent Virtual Connection), SVC (Switched virtual connection), or SPVC (Soft Switched virtual connection).

FIG. 1 shows a diagram of an example configuration for illustrating a connection setup by PVC. In PVC, a network manager sets up connections by inputting setup commands from external input apparatuses 10a through 10d to ATM switching units 14a through 14d, respectively. This connection setup includes setting of connection management data such as port information, VPI (Virtual Path Indentifier), VCI (Virtual Channel Indentifier), cell rate, band, and service category.

The ATM switching units 14a through 14d each establishes a fixed connection based on the setup commands supplied from the external input apparatuses 10a through 10d, respectively. Set connection management data is maintained.

FIG. 2 shows a diagram of an example configuration for illustrating a connection setup by SVC. In SVC, message signal transmission and

reception is performed between each connected ones of ATM switching units 18a through 18d so that the ATM switching units 18a through 18d store route information 20a through 20d, respectively. The connection setup is performed based on the route information.

For instance, a transmitting terminal 16a connected to the transmitting ATM switching unit 18a transmits a SETUP (a call connection request message) storing information such as address of a receiving terminal 16d, band information, and service category through a signal channel for signaling of the SETUP to the receiving terminal 16d connected to the receiving ATM switching unit 18d.

In the case of normal connection, receiving the SETUP, the receiving terminal 16d transmits a CONNECT (a call connection confirmation message) to the transmitting terminal 16a and performs a connecting operation. Thus, according to SVC, a connection is established by a signaling signal that supports switching connection.

SPVC includes PVC and SVC. Fixed connections are established between a transmitting terminal and a transmitting ATM switching unit and between a receiving terminal and a receiving ATM switching unit based on setup commands supplied from external input apparatuses. On the other hand, a connection is established between the transmitting and receiving ATM switching units by the transmitting ATM switching unit transmitting a SETUP to the receiving ATM switching unit and the receiving ATM switching unit thereafter transmitting a CONNECT to the transmitting ATM switching unit.

However, PVC requires the network manager to input the connection management data through the external input apparatuses 10a through 10d to the ATM switching units 14a through 14d, respectively,

thus costing a lot of time.

In the case of SVC, it is not required to input the connection management data to each of the ATM switching units 18a through 18d. However, if a failure occurs on a network after the connections are established, all the connections set up with respect to the ATM switching units 18a through 18d are released as shown in FIG. 3.

In order to reestablish the connections, it is necessary to perform the connection setup from a stage of storing the route information 20a through 20d in the ATM switching units 18a through 18d, respectively. Therefore, there has been a problem in that SVC requires a predetermined period of time in each connection setup, thus taking time in failure recovery.

Further, as in SVC, it is also required in SPVC to perform the connection setup from the stage of storing the route information in each of the ATM switching units if all the connections are released due to a failure occurring on the network after the connections are established. In this case, there is a problem in that the connections are prevented from being established until the message signal transmission and reception is completed between each connected ones of the ATM switching units so that the route information is stored therein.

DISCLOSURE OF THE INVENTION

The present invention is made in view of the above-described respects and has an object of providing a connection data change method and device, and a switching unit by which connection management data can be set easily and connections can be established in a shorter period of time in a failure recovery.

In order to achieve this object, the

present invention is configured to include connection data management means for managing connection data for connection with another switching unit and change operation means for changing the connection data, and changing the connection with the other switching unit to a fixed connection type or a variable connection type, wherein the change operation means makes a change to the variable connection type when the connection is made, and makes a change to the fixed connection type after the connection is completed.

Thus, connection with another switching unit is changeable to a fixed connection type or variable connection type so that the connection can be easily made by making a change to the variable connection type at the time of connecting and reconnection can be made instantly by making a change to the fixed connection type after the connection is completed. Accordingly, the connection with another switching unit can be made easily and the reconnection can be made in a shorter period of time.

Additionally, according to the present invention, the change operation means may be configured to change the connection with the other switching unit to the fixed connection type or the variable connection type in accordance with a command input from an outside.

Thus, the connection with another switching unit can be changed to the fixed connection type or variable connection type in accordance with a command input from the outside, so that convenience can be increased.

Additionally, according to the present invention, the connection data change device may be configured to include a first detection part detecting another connected switching unit, first

message editing means for generating a message controlling change operation means of the other detected switching unit, and first notification means for notifying the other detected switching unit of the message.

Thus, it is possible to notify another connected switching unit of a message controlling change operation means, so that connecting a plurality of switching units can be simplified. Accordingly, it is possible to increase convenience.

Additionally, according to the present invention, the connection data change device may be configured to further include first analysis means for receiving the message and analyzing contents.

Thus, a message transmitted from another switching unit can be received and the contents can be analyzed so that the change operation means can be controlled in accordance with the contents. Therefore, connecting a plurality of switching units can be simplified, so that convenience can be increased.

Additionally, according to the present invention, the connection data change device may be configured to further include release means for changing the connection with the other switching unit from the fixed connection type to the variable connection type and releasing the connection with the other switching unit.

Thus, a release operation can be simplified by making a change from the fixed connection type to the variable connection type in releasing the connection with another switching unit. Accordingly, the release operation of the connection with another switching unit can be simplified, so that convenience can be increased.

Additionally, according to the present invention, the connection data change device may be

configured to include a second detection part detecting another connected switching unit, second message editing means for generating a message controlling release means of the other detected switching unit, second notification means for notifying the other detected switching unit of the message, and second analysis means for receiving the message from another switching unit and analyzing contents.

Thus, it is possible to notify another connected switching unit of a message controlling release means. Further, a message transmitted from another switching unit can be received and the contents can be analyzed so that the release means can be controlled in accordance with the contents. Accordingly, the release operation of a connection between a plurality of switching units can be simplified, so that convenience can be increased.

Additionally, according to the present invention, the connection data change device may be configured to further include release reason storage means for storing a valid release reason for releasing the connection with the other switching unit.

Thus, it can be set with respect to each release reason whether to perform the release operation by storing a valid release reason for releasing the connection with another switching unit. For instance, in the case of a release reason originating in such a line failure as to disconnect communication only temporarily, the communication becomes performable immediately after a recovery from the failure by not performing the release operation. Therefore, the disconnection period of the communication can be shortened, so that the convenience of a switching unit can be increased.

Further, the present invention may be

configured to include the step of extracting connection data for connection with another switching unit and the step of changing the extracted connection data, and changing the connection with the other switching unit to a fixed connection type or a variable connection type, wherein a change to the variable connection type is made when the connection is made, and a change to the fixed connection type is made after the connection is completed.

Furthermore, the present invention is configured to include connection data management means for managing connection data for connection with another switching unit and change operation means for changing the connection data, and changing the connection with the other switching unit to a fixed connection type or a variable connection type, wherein the change operation means makes a change to the variable connection type when the connection is made, and makes a change to the fixed connection type after the connection is completed.

Thus, connection with another switching unit is changeable to a fixed connection type or variable connection type so that the connection can be easily made by making a change to the variable connection type at the time of connecting and reconnection can be made instantly by making a change to the fixed connection type after the connection is completed. Accordingly, the connection with another switching unit can be made easily and the reconnection can be made in a shorter period of time.

Additionally, according to the present invention, the switching unit may be configured to further include a first detection part detecting another connected switching unit, first message editing means for generating a message controlling

change operation means of the other detected switching unit, first notification means for notifying the other detected switching unit of the message, and first analysis means for receiving the message and analyzing contents.

Thus, it is possible to notify another connected switching unit of a message controlling change operation means, so that connecting a plurality of switching units can be simplified. Further, a message transmitted from another switching unit can be received and the contents can be analyzed so that the change operation means can be controlled in accordance with the contents.

Therefore, connecting a plurality of switching units can be simplified, so that convenience can be increased.

Additionally, according to the present invention, the switching unit may be configured to include release means for changing the connection with the other switching unit from the fixed connection type to the variable connection type and releasing the connection with the other switching unit and release reason storage means for storing a valid release reason for releasing the connection with the other switching unit.

Thus, a release operation can be simplified by changing the connection with another switching unit from the fixed connection type to the variable connection type in releasing the connection. Further, it can be set with respect to each release reason whether to perform the release operation by storing a valid release reason for releasing the connection with another switching unit

Accordingly, the release operation of the connection with another switching unit can be simplified, so that convenience can be increased.

BRIEF DESCRIPTION OF THE DRAWINGS

Features and advantages of the present invention will become more apparent from the following detailed description when read in conjunction with the accompanying drawings, in which:

FIG. 1 is a diagram showing an example configuration for illustrating a connection setup by PVC;

FIG. 2 is a diagram showing an example configuration for illustrating a connection setup by SVC;

FIG. 3 is a diagram showing an example configuration for illustrating a connection release;

FIG. 4 is a diagram showing a configuration of a switching unit of the present invention;

FIG. 5 is a diagram for illustrating a first embodiment of the switching unit of the present invention;

FIG. 6 is a diagram showing a configuration of a connection management data table;

FIG. 7 is a flowchart of an operation process at a time of a connection change;

FIG. 8 is a diagram showing a configuration of dynamic information;

FIG. 9 is a diagram showing a network configuration for illustrating an operation at a time of a connection reset;

FIG. 10 is a flowchart of an operation process at a time of the connection reset;

FIG. 11 is a diagram for illustrating a second embodiment of the switching unit of the present invention;

FIG. 12 is a flowchart of an operation process performed when a connection change request is made;

FIG. 13 is a diagram showing a configuration of the connection change request;

FIG. 14 is a diagram for illustrating a third embodiment of the switching unit of the present invention;

FIG. 15 is a diagram for illustrating the third embodiment of the switching unit of the present invention;

FIG. 16 is a flowchart of an operation process of a connection batch change;

FIG. 17 is a diagram showing a sequence drawing for illustrating an operation process of the connection batch change;

FIG. 18 is a diagram showing a configuration of batch change data;

FIG. 19 is a diagram for illustrating a fourth embodiment of the switching unit of the present invention;

FIG. 20 is a diagram for illustrating the fourth embodiment of the switching unit of the present invention;

FIG. 21 is a flowchart of an operation process of a connection automatic change;

FIG. 22 is a diagram showing a sequence drawing for illustrating an operation process of the connection automatic change;

FIG. 23 is a diagram showing a configuration of automatic change data;

FIG. 24 is a diagram for illustrating a fifth embodiment of the switching unit of the present invention;

FIG. 25 is a flowchart of an operation process of a manual connection release;

FIG. 26 is a diagram for illustrating a sixth embodiment of the switching unit of the present invention;

FIG. 27 is a diagram for illustrating an

established connection;

FIG. 28 is a diagram for illustrating a released connection;

FIG. 29 is a flowchart of an operation process of a connection automatic release; and

FIG. 30 is a diagram showing a configuration of release reason data.

BEST MODE FOR CARRYING OUT THE INVENTION

A description is given below, with reference to the drawings, of embodiments of the present invention.

FIG. 4 shows a block diagram of an embodiment of a switching unit of the present invention. In FIG. 4, a switching unit 30 is configured to include a switch part 31 and an application part 32. The application part 32 includes a switching operation part 33, a message analysis part 34, an adjacent node notification part 35, an adjacent node analysis part 36, a message editing part 37, an external input analysis part 38, a change operation part 39, a connection management data table 40, a routing table 41, and a release reason data table 42.

The switch part 31 performs routing (a switching operation) on a cell supplied from a transmission path 43 or 44 and transmits the cell to a virtual channel (hereinafter referred to as a VC). The routing table 41 is a table managing routing information on adjacent nodes stored by exchanging message signals with another switching unit. This routing information is used at the time of a connection setup by means of SVC and SPVC.

The connection management data table 40 is a table managing a variety of connections set up in the switching unit 30. The change operation part 39, as will be described later, suitably changes

information on a connection type (for instance, SVC) of the connection management data table 40.

The switching operation part 33 performs a connection setup operation and a connection deletion operation in accordance with the connection management data table 40. The adjacent node notification part 35 transmits a later-described connection change request message to the corresponding adjacent node. The adjacent node analysis part 36 analyzes the state of an adjacent node and determines whether to transmit the received connection change request message to the adjacent node.

The external input analysis part 38, to which an external input apparatus 50 is connected, analyzes a setup command input from the external input apparatus 50, and performs a connection setup operation in accordance with the contents of the setup command. The message analysis part 34 analyzes the message signal used for signaling, and, based on the analysis results, requests the change operation part 39 and the adjacent node analysis part 36 to perform operations. The message editing part 37 edits the contents of the setup command input from the external input terminal 50 to generate the message signal.

The transmission paths 43 and 44 are physical lines for connection to the adjacent nodes. Signal channels 45 and 46 are VCs multiplexed in the transmission paths 43 and 44, respectively, and are signaling connections for communicating the message signal for signaling. The release reason data table 42 is release reason data entered by a network manager, and recorded with release reasons that are made valid when a connection release operation is performed.

Next, a description will be given, with

reference to FIGS. 5 through 10, of a first embodiment of the present invention. FIG. 5 shows a diagram for illustrating the first embodiment of the switching unit of the present invention. The switching unit 30 of FIG. 5 has the same configuration as the switching unit of FIG. 4, and necessary parts for illustrating the first embodiment are shown.

The connection management data table 40 of FIG. 5 has a configuration shown in FIG. 6. FIG. 6 is a diagram showing the configuration of the connection management data table 40. In FIG. 6, connection management data 53 is set for each line number in the connection data management table 40.

The connection management data 53 includes a connection management number, a connection type, a connection VP identifier, a connection VC identifier, connection QOS, a band used for connection, a connection category, and other connection attributes.

The present invention enables a connection setup that has the advantages of both PVC that is a static connection and SVC/SPVC that is a dynamic connection by suitably changing the connection type from the dynamic connection that is set up dynamically to the static connection that is set up statically. Hereinafter, this connection setup is referred to as a PSVC (Permanent Switched Virtual Connection).

A description is given below, in accordance with the flowchart of FIG. 7, of an operation of the switching unit 30 of FIG. 5 at the time of a connection change. FIG. 7 shows a flowchart of an operation process at the time of the connection change.

In step S10, the message analysis part 34 receives a connection change request, and proceeds to step S20. In step S20, the message analysis part

34 analyzes the contents of the received connection change request, generates input information (line number, VPI, VCI, etc.) for connection change, and supplies the input information to the change operation part 39.

In step S30, when supplied with the input information for connection change, the change operation part 39 extracts connection management data 53a of corresponding line numbers from the connection data management table 40.

Proceeding to step S40 after step S30, a connection type included in the extracted connection management data 53a is changed from SVC/SPVC that is a dynamic connection to PSVC that is a static connection. Connection management data 53b is connection management data where the connection type is changed from SVC/SPVC that is a dynamic connection to PSVC that is a static connection.

Proceeding to step S50 after step S40, dynamic information 54 shown in FIG. 8, set in SVC/SPVC that is a dynamic connection, is stored.

FIG. 8 shows a diagram of a configuration of the dynamic information 54. The dynamic information 54 includes a connection management number, a self-line number, a connection destination node number, connection status, a connection VP identifier, and a connection VC identifier.

As above described, an operation process at the time of a static connection change can be realized by an operation process at the time of a dynamic connection change, thus simplifying an operation at the time of a connection change.

Next, a description is given, in accordance with the flowchart of FIG. 10, of an operation of a network of FIGS. 9A and 9B at the time of a connection reset. FIG. 10 is a flowchart of an operation process at the time of the

connection reset.

As shown in FIG. 9A, if the connections of a switching unit 58d are released due to occurrence of a failure on the network after the connections are established, the switching unit 58d requires the connections to be reset.

In step S100, the switching unit 58d extracts the connection type of the line of each line number from the connection management data table 40. Proceeding to step S110 after step S100, it determines whether the extracted connection type is a dynamic connection.

If it determines that the extracted connection type is a dynamic connection (YES in S110), step S120 is entered. If it determines that the extracted connection type is not a dynamic connection (NO in S110), step S130 is entered.

In step S120, since the extracted connection type is a dynamic connection, the switch part 31 is requested to set up the connections, and the connections are set up from a stage of storing the route information.

On the other hand, in step S130, since the extracted connection type is not a dynamic connection, the connections are reset by referring to the connection management data stored in the connection management data table 40. Here, if the connection type is PSVC, the connections are reset as shown in FIG. 9B by referring to the connection management data 53 without waiting for the route information to be stored.

Therefore, if the connection type is PSVC, the connections can be established in a shorter period of time than in the case of SVC and SPVC that are dynamic connections since the connections are reset in accordance with the connection management data 53.

Next, a description is given, with reference to FIGS. 11 through 13, of a second embodiment of the present invention. FIG. 11 shows a diagram for illustrating the second embodiment of the switching unit of the present invention. Each of switching units 30a through 30c of FIG. 11 has the same configuration as the switching unit of FIG. 4, and necessary parts for illustrating the second embodiment are shown.

A description is given below, in accordance with the flowchart of FIG. 12, of operations of the switching units 30a through 30c when a connection change request is made. FIG. 12 is a flowchart of an operation process performed when the connection change request is made.

In step S150, a connection change request is input from an external input apparatus 50a connected to the switching unit 30a with a dynamic connection to be changed being specified. The connection change request input to the external input apparatus 50a is supplied to an external input analysis part 38a.

Proceeding to step S160 after step S150, the external input analysis part 38a analyzes the supplied connection change request, and supplies information on the analysis results to a change operation part 39a.

Proceeding to step S170 after step S160, the change operation part 39a extracts from a connection management data table 40a the connection management data 53 of a corresponding line number in accordance with the supplied information on the analysis results.

Proceeding to step S180 after step S170, the change operation part 39a change a connection type included in the extracted connection management data 53 from a dynamic connection to PSVC that is a

static connection. Proceeding to step S190 after step S180, the dynamic information 54 of FIG. 8 set in SVC/SPVC that is a dynamic connection is stored.

In step S200, adjacent node information is extracted based on the routing information of a routing table 41a. Proceeding to step S210 after step S200, an adjacent node analysis part 36a determines based on the extracted adjacent node information whether there is an adjacent node.

If it determines that there is an adjacent node (YES in S210), the adjacent node analysis part 36a supplies information to that effect to an adjacent node notification part 35a and the operation of step S220 is performed. If it determines that there is no adjacent node (NO in S210), the operation is terminated.

In step S220, the adjacent node notification part 35a supplies the connection change request to the adjacent node (the switching unit 30b in FIG. 11, for instance) through the signal channel 45. The connection change request supplied from the adjacent node notification part 35a has a configuration shown in FIG. 13, for instance.

FIG. 13 shows a diagram of a configuration of the connection change request. In FIG. 13, a connection change request 60 includes a request information header, a message type, an automatic-change-enabled line number, an automatic change connection type, a connection VP identifier, a connection VC identifier, and additional information.

The switching unit 30b receives the connection change request 60 in a message analysis part 38b. The message analysis part 38b analyzes the supplied connection change request 60 and supplies information on the analysis results to a change operation part 39b.

Thereafter, through the same operations as

steps S170 through S190, the connection management data 53 of corresponding line numbers is extracted from a connection management data table 40b in accordance with the information on the analysis results, and the connection management data 53 is altered. Further, through the same operations as steps S200 through S220, it is determined whether there is an adjacent node, and if there is an adjacent node (the switching unit 30c in FIG. 11, for instance), the connection change request 60 is supplied to the switching unit 30c through the signal channel 46.

Accordingly, the setting of the connection management data 53 for a plurality of nodes can be simplified, so that convenience can be increased.

Next, a description is given, with reference to FIGS. 14 through 18, of a third embodiment of the present invention. FIGS. 14 and 15 show diagrams for illustrating the third embodiment of the switching unit of the present invention. Each of the switching units 30a through 30c of FIGS. 14 and 15 has the same configuration as the switching unit of FIG. 4, and necessary parts for illustrating the third embodiment are shown.

A description is given below, in accordance with the flowchart of FIG. 16, of operations of the switching units 30a through 30c when a connection batch change is performed. FIG. 16 shows a flowchart of an operation process at the time of the connection batch change. It is assumed that the switching unit 30a of FIG. 14 is connected via the signal channel 45 to the switching unit 30b of FIG. 15.

In step S250, a connection batch change is entered from the external input apparatus 50a connected to the switching unit 30a. Proceeding to step S260 after step S250, batch change data 62 as

shown in FIG. 18 is created and entered.

FIG. 18 shows a diagram of a configuration of the batch change data 62. The batch change data 62 includes a batch-change-enabled line number and a batch change connection type. For instance, the batch change connection type is SVC and SPVC in the batch change data 62 of FIG. 18.

Proceeding to step S270 after step S260, a connection operation for establishing connections by SVC/SPVC is performed. The operation of step S270 is performed, for instance, in accordance with the procedure of a sequence diagram shown in FIG. 17. FIG. 17 shows a sequence diagram for illustrating an operation process at the time of the connection batch change.

In the case of establishing connections between terminals 56a and 56b, a connection request (a call connection request message) is transmitted from the terminal 56a via the switching units 30a through 30c to the terminal 56c so that the connection operation is performed. In the case of normal connection, the terminal 56c transmits a response message (a call connection confirmation message) via the switching units 30a through 30c to the terminal 56a. Therefore, the switching unit 30a receives the response message from the switching unit 30b.

Proceeding to step S280 after step S270, the switching unit 30a detects the response message supplied from the switching unit 30b in a message analysis part 34a, and determines whether a line number relating to the connection operation is identical to the batch-change-enabled line number included in the batch change data.

If it determines that the line number relating to the connection operation is identical to the batch-change-enabled line number included in the

batch change data (YES in S280), step S290 is entered. If it determines that the line number relating to the connection operation is not identical to the batch-change-enabled line number included in the batch change data (NO in S280), the operation is terminated.

In step S290, a connection type included in the connection management data 53 of the line number is changed to PSVC. Proceeding to step S300 after S290, the dynamic information 54 set in SVC/SPVC that is a dynamic connection is stored.

Proceeding to step S310 after step S300, adjacent node information is extracted based on the routing information of the routing table 41a. Proceeding to step S320 after step S310, the adjacent node analysis part 36a determines based on the extracted adjacent node information whether there is an adjacent node.

If it determines that there is an adjacent node (YES in S320), the adjacent node analysis part 36a supplies information to that effect to a message editing part 37a, and the operation of step S330 is performed. If it determines that there is no adjacent node (NO in S320), the operation is terminated.

In step S330, the message editing part 37a edits the connection change request message 60 to be transmitted to the adjacent node, and supplies the connection change request message 60 to the adjacent node notification part 35a. Then, proceeding to step S340 after step S330, the adjacent node notification part 35a supplies the connection change request message 60 to the switching unit 30b, which is the adjacent node.

In switching unit 30b, through the same operations as steps S170 through S190 of FIG. 12, the connection management data 53 of corresponding

line numbers is extracted from the connection management data table 40b in accordance with the information on the supplied analysis results so that the connection management data 53 is altered.

Further, through the same operations as steps S200 through S220 of FIG. 12, it is determined whether there is an adjacent node, and if there is an adjacent node, the connection change request message is supplied via the signal channel 46 to the switching unit 30c.

Accordingly, a connection batch change operation can be performed on a plurality of nodes and the setting of the connection management data 53 can be simplified, so that convenience can be increased.

Next, a description is given, with reference to FIGS. 19 through 23, of a fourth embodiment of the present invention. FIGS. 19 and 20 show diagrams for illustrating the fourth embodiment of the switching unit of the present invention. Each of the switching units 30a through 30c of FIGS. 19 and 20 has the same configuration as the switching unit of FIG. 4, and necessary parts for illustrating the fourth embodiment are shown.

A description is given below, in accordance with the flowchart of FIG. 21, of operations of the switching units 30a through 30c of FIGS. 19 and 20 when a connection automatic change is performed. FIG. 21 shows a flowchart of an operation process at the time of the connection automatic change. It is assumed that the switching unit 30c of FIG. 19 is connected via the signal channel 46 to the switching unit 30b of FIG. 20.

In step S400, a connection automatic change is entered from an external input apparatus 50c connected to the switching unit 30c. The connection automatic entry change may be performed

using the external input apparatus 50a connected to the switching unit 30a. Proceeding to step S410 after step S400, automatic change data 64 as shown in FIG. 23 is created and entered.

FIG. 23 shows a diagram of a configuration of the automatic change data 64. The automatic change data 64 includes an automatic-change-enabled line number and an automatic change connection type. For instance, the automatic change connection type is SVC and SPVC in the batch change data 64 of FIG. 23.

Proceeding to step S420 after step S410, a connection operation for establishing connections by SVC/SPVC is performed. The operation of FIG. 420 is performed, for instance, in accordance with the procedure of a sequence diagram shown in FIG. 22. FIG. 22 shows a sequence diagram for illustrating an operation process at the time of the connection automatic change.

In the case of establishing connections between the terminals 56a and 56c, a connection request (a call connection request message) is transmitted from the terminal 56a via the switching units 30a through 30c to the terminal 56c so that the connection operation is performed. In the case of normal connection, the terminal 56c transmits a response message (a call connection confirmation message) to the switching unit 30c.

Proceeding to step S430 after step S420, the switching unit 30c detects the response message supplied from the terminal 56c in a message analysis part 34c, and determines whether a line number relating to the connection operation is identical to the automatic-change-enabled line number included in the automatic change data.

If it determines that the line number relating to the connection operation is identical to

the automatic-change-enabled line number included in the automatic change data (YES in S430), step S440 is entered. If it determines that the line number relating to the connection operation is not identical to the automatic-change-enabled line number included in the automatic change data (NO in S430), the operation is terminated.

In step S440, a connection type included in the connection management data 53 of the corresponding line number is changed to PSVC. Proceeding to step S450 after step S440, the dynamic information 54 set in the dynamic connection of SVC/SPVC is stored.

Proceeding to step S460 after step S450, adjacent node information is extracted based on the routing information of a routing table 41c. Proceeding to step S470 after step S460, an adjacent node analysis part 36c determines based on the extracted adjacent node information whether the switching unit 30c has an adjacent node.

If it determines that there is an adjacent node (YES in S470), the adjacent node analysis part 36c supplies information to that effect to a message editing part 37c, and the operation of step S480 is performed. If it determines that there is no adjacent node (NO in S470), the operation is terminated.

In step S480, the message editing part 37c edits a connection change identifier into a response message to be transmitted to the adjacent node, and supplies the response message to an adjacent node notification part 35c. Proceeding to step S490 after step S480, the adjacent node notification part 35c supplies the response message to the switching unit 30b, which is the adjacent node.

When the switching unit 30b detects the connection change identifier included in the

supplied response message in the message analysis part 34b, through the same operations as steps S430 through S450, the connection management data 53 of corresponding line numbers is extracted from the connection management data table 40b in accordance with the supplied response message so that the connection management data 53 is altered.

Further, through the same operations as steps S460 through S490, it is determined whether there is an adjacent node, and if there is an adjacent node, a response message having a connection change identifier edited therein is supplied via the signal channel 45 to the switching unit 30a.

Accordingly, a connection automatic change operation can be performed on a plurality of nodes and the setting of the connection management data 53 can be simplified, so that convenience can be increased.

Next, a description is given, with reference to FIGS. 24 and 25, of a fifth embodiment of the present invention. FIG. 24 shows a diagram for illustrating the fifth embodiment of the switching unit of the present invention. Each of the switching units 30a and 30b of FIG. 24 has the same configuration as the switching unit of FIG. 4, and necessary parts for illustrating the fifth embodiment are shown.

A description is given below, with reference to the flowchart of FIG. 25, of operations performed by the switching units 30a and 30b when a manual connection release is performed. FIG. 25 shows a flowchart of an operation process at the time of the manual connection release.

In step S500, a connection release request is input from the external input apparatus 50a connected to the switching unit 30a. The connection

release request input to the external input apparatus 50a is supplied to the external input analysis part 38a. Proceeding to step S510 after S500, the external input analysis part 38a analyzes the supplied connection release request, and supplies information on the analysis results to the change operation part 39a and the adjacent node analysis part 36a.

Proceeding to step S520 after step S510, the change operation part 39a extracts the connection management data 53 of a corresponding line number from the connection management data table 40a in accordance with the supplied analysis results. Proceeding to step S530 after step S520, the change operation part 39a changes a connection type included in the extracted connection management data 53 from PSVC that is a static connection to SVC/SPVC that is a dynamic connection.

In step S540, adjacent node information is extracted based on the routing information of the routing table 41a. Proceeding to step S550 after step S540, the adjacent node analysis part 36a determines based on the extracted adjacent node information whether there is an adjacent node.

If it determines that there is an adjacent node (YES in S550), the adjacent node analysis part 36a supplies information to that effect to the message editing part 37a, and the operation of step S560 is performed. If it determines that there is no adjacent node (NO in S550), step S580 is entered.

In step S560, the message editing part 37a edits a release request message, and supplies the release request message to the adjacent node notification part 35a. Proceeding to step S570 after step S560, the adjacent node notification part 35a supplies the connection release request message via the signal channel 45 to the adjacent node (the

switching unit 30b in FIG. 24, for instance). The connection release request message supplied from the adjacent node notification part 35a is formed, for instance, by setting the message type of the message of FIG. 13 to a release request.

In step S580, after transmitting the connection release request message to the switching unit 30b, the switching unit 30a waits until receiving a release response message. Proceeding to step S590 after step S580, the message analysis part 34a determines whether the release response message is received.

If it determines that the release response message is received (YES in S590), step S600 is entered so that the connection management data 53 extracted in step S520 is released. If it determines that no release response message is received (NO in S590), the operation is terminated. Proceeding to step S610 after step S600, a corresponding connection is deleted.

When the switching unit 30b receives the release request message in the message analysis part 34b, a connection release operation is performed through the same operations as steps S510 through 610.

Next, a description is given, with reference to FIGS. 26 through 30, of a sixth embodiment of the present invention. FIG. 26 shows a diagram for illustrating the sixth embodiment of the switching unit of the present invention. Each of the switching units 30a through 30d of FIG. 26 has the same configuration as the switching unit of FIG. 4, and necessary parts for illustrating the fifth embodiment are shown.

A description is given below, in accordance with the flowchart of FIG. 29, of operations of the switching units 30a through 30d

when a connection automatic release is performed. FIG. 29 shows a flowchart of an operation process at the time of the connection automatic release. As shown in FIG. 27, with respect to the switching units 30a through 30d, a connection PSVC(x) is established between terminals 70a and 70b and a connection PSVC(y) is established between terminals 70c and 70d.

In step S650, a connection release reason is entered from the external input apparatus 50c connected to the switching unit 30c. Proceeding to step S660 after step S650, release reason data 78 as shown in FIG. 30 is created and entered. FIG. 30 shows a diagram of a configuration of the release reason data 78. The release reason data 78 includes a target line number, a target connection type, and a valid release reason.

Proceeding to step S670 after step S660, the message analysis part 34c of the switching unit 30c receives a connection release request. For instance, the message analysis part 34c receives a connection release request (x) of the connection PSVC(x) which is transmitted when the terminal 70a is disconnected normally or a connection release request (y) of the connection PSVC(y) which is transmitted when a system failure occurs in the switching unit 30d due to a line failure.

Proceeding to step S680 after step S670, the message analysis part 34c analyzes the received connection release request and determines whether the connection release request corresponds to the valid release reason of the release reason data 78 entered in step S660.

If it determines that it corresponds to the valid release reason (YES in S680), step S690 is entered so that a change operation part 39c extracts the connection management data 53 of a corresponding

line number from a connection management data table 40c. If it determines that it does not correspond to the valid release reason (NO in S680), step S720 is entered. For instance, in the case of the release reason data 78 of FIG. 26, a valid release reason x is set therein so that the connection release request (x) corresponds to the valid release reason, while the connection release reason (y) does not correspond to the valid release reason.

Proceeding to step S700 after step S690, the change operation part 39c changes a connection type included in the extracted connection management data 53 from PSVC that is a static connection to SVC/SPVC that is a dynamic connection.

Proceeding to step S710 after step S700, adjacent node information is extracted based on the routing information of the routing table 41c. Proceeding to step S720 after step S710, the adjacent node analysis part 36c determines based on the extracted adjacent node information whether there is an adjacent node.

If it determines that there is an adjacent node (YES in step S720), the adjacent node analysis part 36c supplies information to that effect to the message editing part 37c, and the operation of step S730 is performed. If it determines that there is no adjacent node (NO in step S720), step S750 is entered.

In step S730, the message editing part 37c edits a release request message and supplies the release request message to the adjacent node notification part 35c. Proceeding to step S740 after step S730, the adjacent node notification part 35c supplies the connection release request message to the adjacent node.

In step S750, after transmitting the connection release request message to another

switching unit, the switching unit 30c waits until receiving a release response message. Proceeding to step S760 after step S750, the message analysis part 34c determines whether the release response message is received.

If it determines that the release response message is received (YES in S760), step S770 is entered so that the connection management data 53 extracted in step S690 is released. If it determines that no release response message is received (NO in S760), the operation is terminated. Proceeding to step S780 after step S770, a corresponding connection is deleted.

In the case of FIG. 27, for instance, a connection release operation is performed since the connection release request (x) corresponds to the valid release reason x, while no connection release operation is performed since the connection release request (y) does not correspond to the valid release reason x. Therefore, as shown in FIG. 28, the connection PSVC(x) established between the terminals 70a and 70b is released, while the connection PSVC(y) established between the terminals 70c and 70d is not released.

Accordingly, the release operation is performable with respect only to a received release request message that corresponds to the entered valid release reason, and execution/non-execution of the release operation can be selected based on a release reason.

In the above-described embodiments, the connection management data table 40 corresponds to connection data management means, the change operation part 39 corresponds to change operation means and release means, PSVC corresponds to a fixed connection type, PVC/SPVC corresponds to a variable connection type, the adjacent node analysis part 36

corresponds to a first detection part and a second detection part, the message editing part 37 corresponds to first message editing means and second message editing means, the adjacent node notification part 35 corresponds to first notification means and second notification means, the message analysis part 34 corresponds to first analysis means and second analysis means, and the release reason data table 42 corresponds to release reason storage means.

The present invention is not limited to the above-described embodiments, but variations and modifications may be made within the scope of the present invention.

CLAIMS

1. A connection data change device, comprising:

connection data management means for managing connection data for connection with another switching unit; and

change operation means for changing the connection data, and changing the connection with the other switching unit to a fixed connection type or a variable connection type,

wherein said change operation means changes makes a change to the variable connection type when the connection is made, and makes a change to the fixed connection type after the connection is completed.

2. The connection data change device as claimed in claim 1, wherein said change operation means changes the connection with the other switching unit to the fixed connection type or the variable connection type in accordance with a command input from an outside.

3. The connection data change device as claimed in claim 1, comprising:

a first detection part detecting another connected switching unit;

first message editing means for generating a message controlling change operation means of the other detected switching unit; and

first notification means for notifying the other detected switching unit of the message.

4. The connection data change device as claimed in claim 3, further comprising first analysis means for receiving the message and

analyzing contents.

5. The connection data change device as claimed in claim 1, further comprising release means for changing the connection with the other switching unit from the fixed connection type to the variable connection type and releasing the connection with the other switching unit.

6. The connection data change device as claimed in claim 5, further comprising:

a second detection part detecting another connected switching unit;

second message editing means for generating a message controlling release means of the other detected switching unit;

second notification means for notifying the other detected switching unit of the message; and

second analysis means for receiving the message from another switching unit and analyzing contents.

7. The connection data change device as claimed in claim 5, further comprising release reason storage means for storing a valid release reason for releasing the connection with the other switching unit.

8. A connection data change method comprising:

the step of extracting connection data for connection with another switching unit; and

the step of changing the extracted connection data, and changing the connection with the other switching unit to a fixed connection type or a variable connection type,

wherein a change to the variable connection type is made when the connection is made, and a change to the fixed connection type is made after the connection is completed.

9. A switching unit, comprising:

connection data management means for managing connection data for connection with another switching unit; and

change operation means for changing the connection data, and changing the connection with the other switching unit to a fixed connection type or a variable connection type,

wherein said change operation means makes a change to the variable connection type when the connection is made, and makes a change to the fixed connection type after the connection is completed.

10. The switching unit as claimed in claim 9, further comprising:

a first detection part detecting another connected switching unit;

first message editing means for generating a message controlling change operation means of the other detected switching unit;

first notification means for notifying the other detected switching unit of the message; and

first analysis means for receiving the message and analyzing contents.

11. The switching unit as claimed in claim 9, further comprising:

release means for changing the connection with the other switching unit from the fixed connection type to the variable connection type and releasing the connection with the other switching unit; and

release reason storage means for storing a valid release reason for releasing the connection with the other switching unit.

ABSTRACT

The present invention relates to a connection data change method and device, and a switching unit for changing connection data for a node constituting a network, and includes connection data management means for managing connection data for connection with another switching unit and change operation means for changing the connection data, and changing the connection with the other switching unit to a fixed connection type or a variable connection type, wherein the change operation means makes a change to the variable connection type when the connection is made and makes a change to the fixed connection type after the connection is completed.

FIG.1

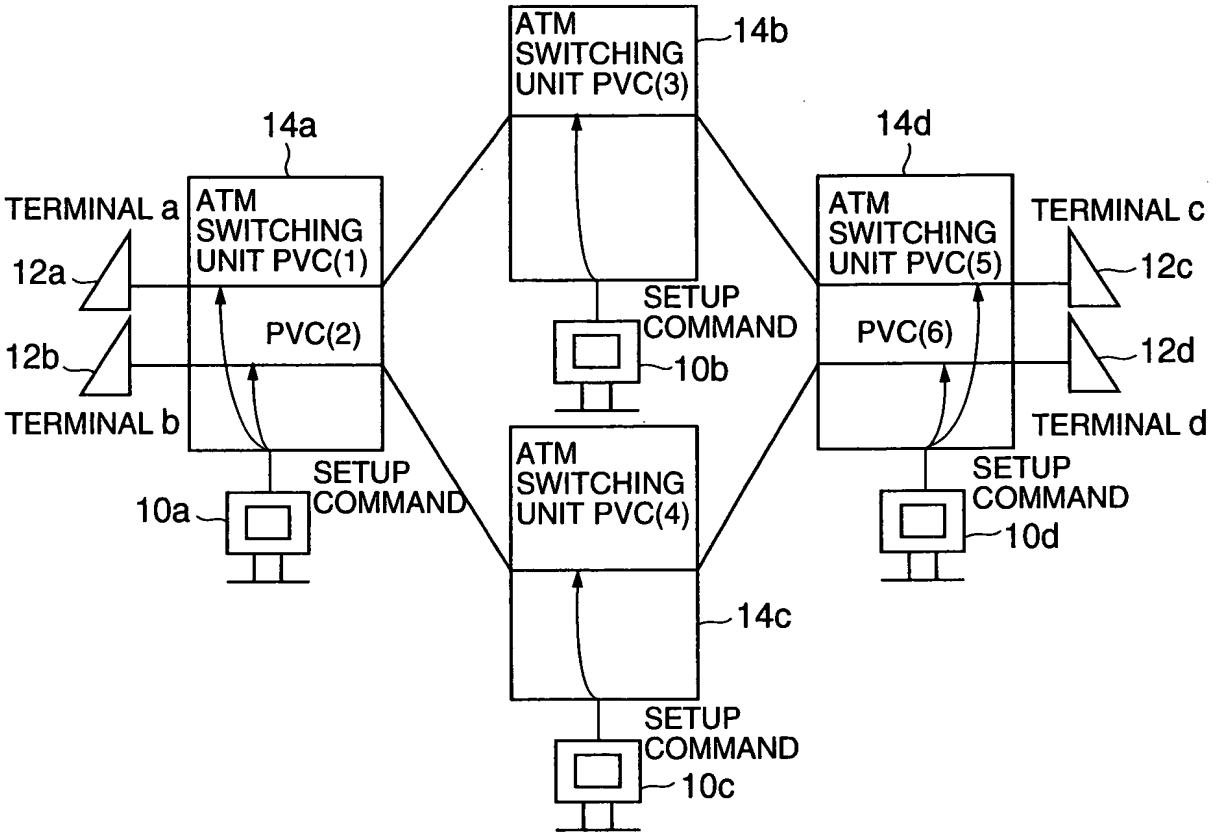

ATM SWITCHING UNIT PVC(3)
14b
14a
14d
TERMINAL a
ATM SWITCHING UNIT PVC(1)
ATM SWITCHING UNIT PVC(5)
TERMINAL c
12a
12c
SETUP COMMAND
PVC(2)
PVC(6)
12b
12d
10b
TERMINAL b
TERMINAL d
ATM SWITCHING UNIT PVC(4)
SETUP COMMAND
SETUP COMMAND
10a
10d
14c
SETUP COMMAND
10c

FIG.2

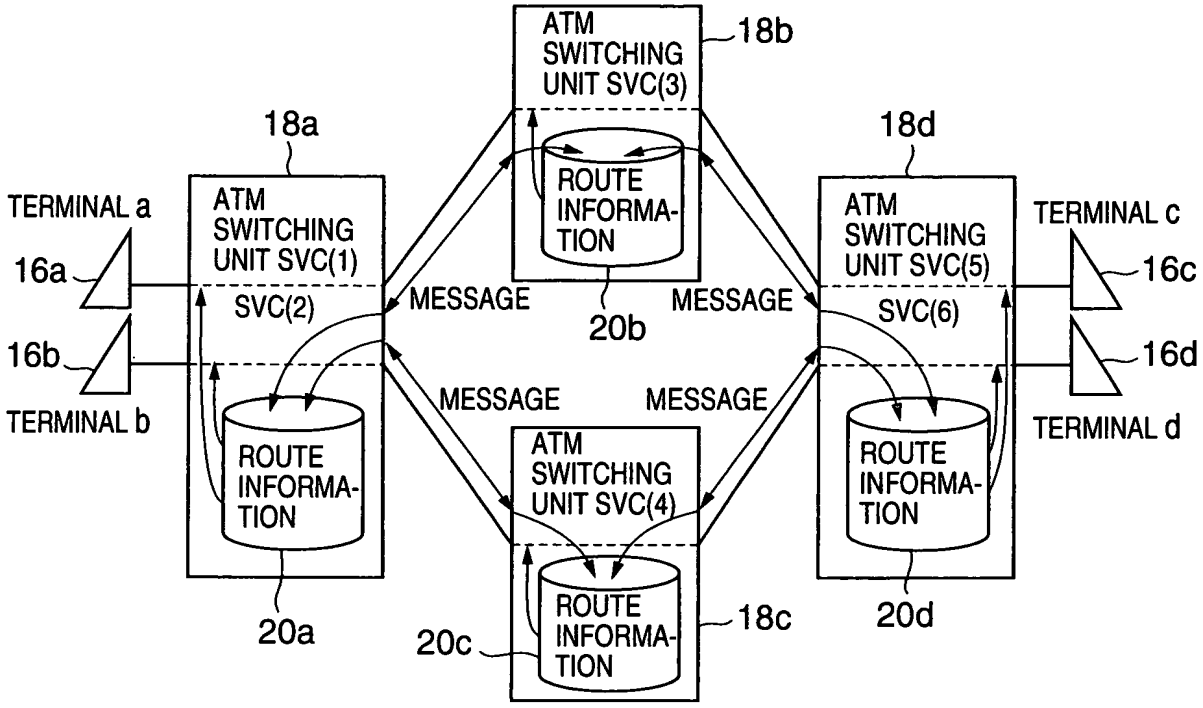

ATM SWITCHING UNIT SVC(3)
18b
18a
18d
ROUTE INFORMA-TION
TERMINAL a
ATM SWITCHING UNIT SVC(1)
ATM SWITCHING UNIT SVC(5)
TERMINAL c
16a
SVC(2)
MESSAGE
MESSAGE
SVC(6)
16c
20b
16b
16d
MESSAGE
MESSAGE
TERMINAL b
ATM SWITCHING UNIT SVC(4)
TERMINAL d
ROUTE INFORMA-TION
ROUTE INFORMA-TION
ROUTE INFORMA-TION
20a
20c
18c
20d

FIG.3

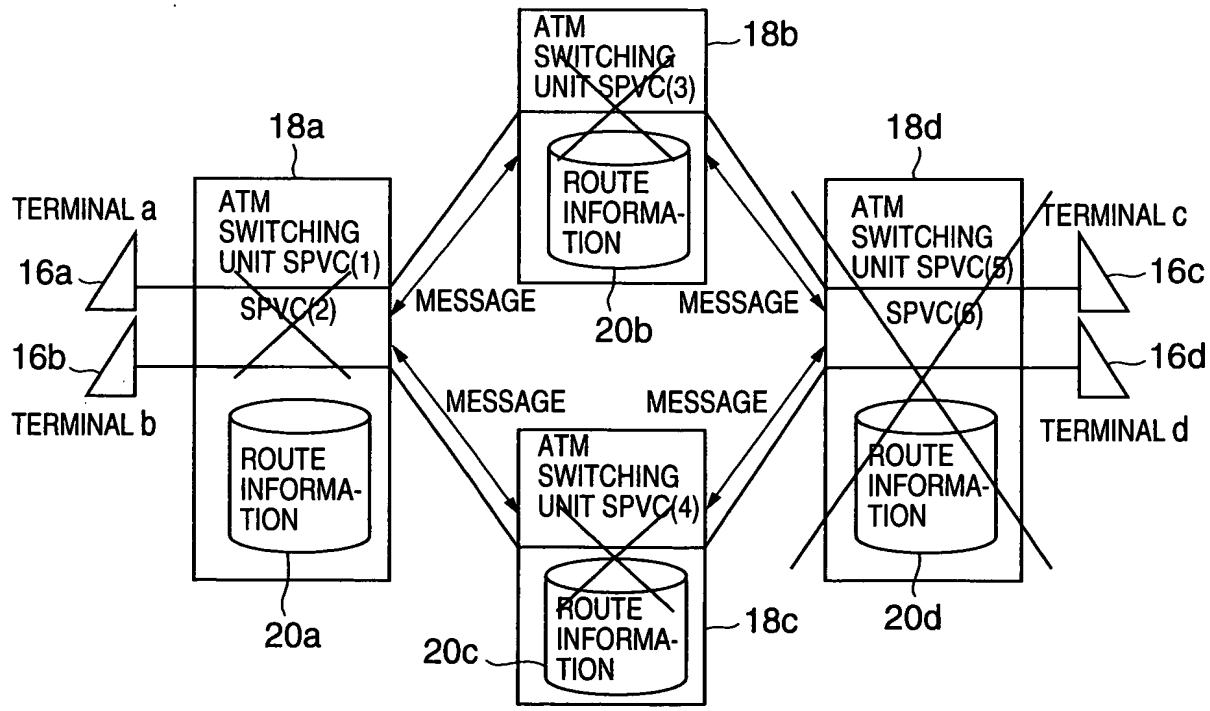

ATM SWITCHING UNIT SPVC(3)
18b
18a
18d
ROUTE INFORMA-TION
TERMINAL a
ATM SWITCHING UNIT SPVC(1)
ATM SWITCHING UNIT SPVC(5)
TERMINAL c
16a
SPVC(2)
MESSAGE
MESSAGE
SPVC(6)
16c
20b
16b
16d
MESSAGE
MESSAGE
TERMINAL b
ATM SWITCHING UNIT SPVC(4)
TERMINAL d
ROUTE INFORMA-TION
ROUTE INFORMA-TION
ROUTE INFORMA-TION
20a
20c
18c
20d

FIG.4

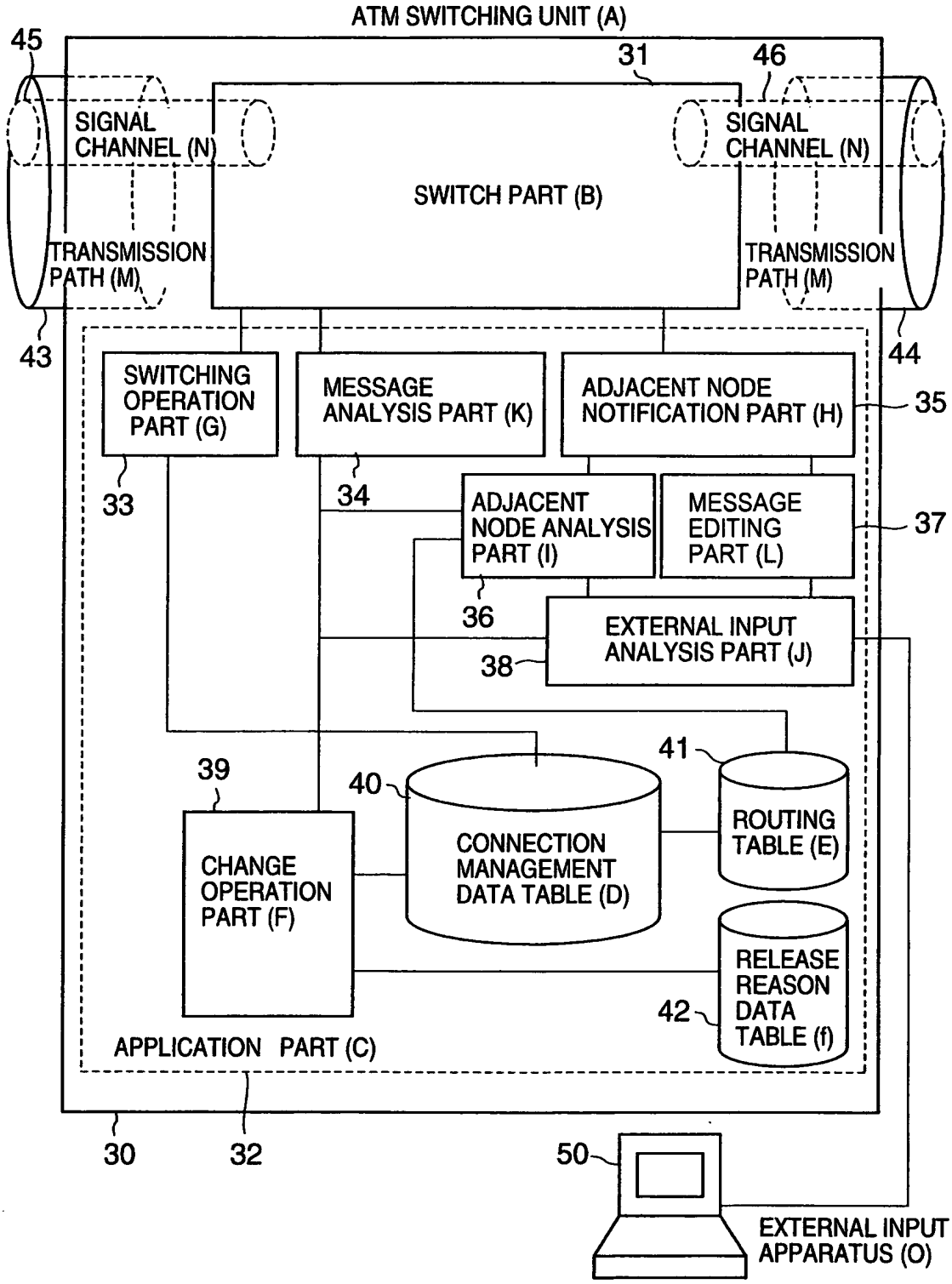

ATM SWITCHING UNIT (A)
45
31
46
SIGNAL CHANNEL (N)
SWITCH PART (B)
SIGNAL CHANNEL (N)
TRANSMISSION PATH (M)
TRANSMISSION PATH (M)
43
44
SWITCHING OPERATION PART (G)
MESSAGE ANALYSIS PART (K)
ADJACENT NODE NOTIFICATION PART (H)
35
33
34
ADJACENT NODE ANALYSIS PART (I)
MESSAGE EDITING PART (L)
37
36
EXTERNAL INPUT ANALYSIS PART (J)
38
41
39
40
ROUTING TABLE (E)
CONNECTION MANAGEMENT DATA TABLE (D)
CHANGE OPERATION PART (F)
RELEASE REASON DATA TABLE (f)
42
APPLICATION PART (C)
30
32
50
EXTERNAL INPUT APPARATUS (O)

FIG.5

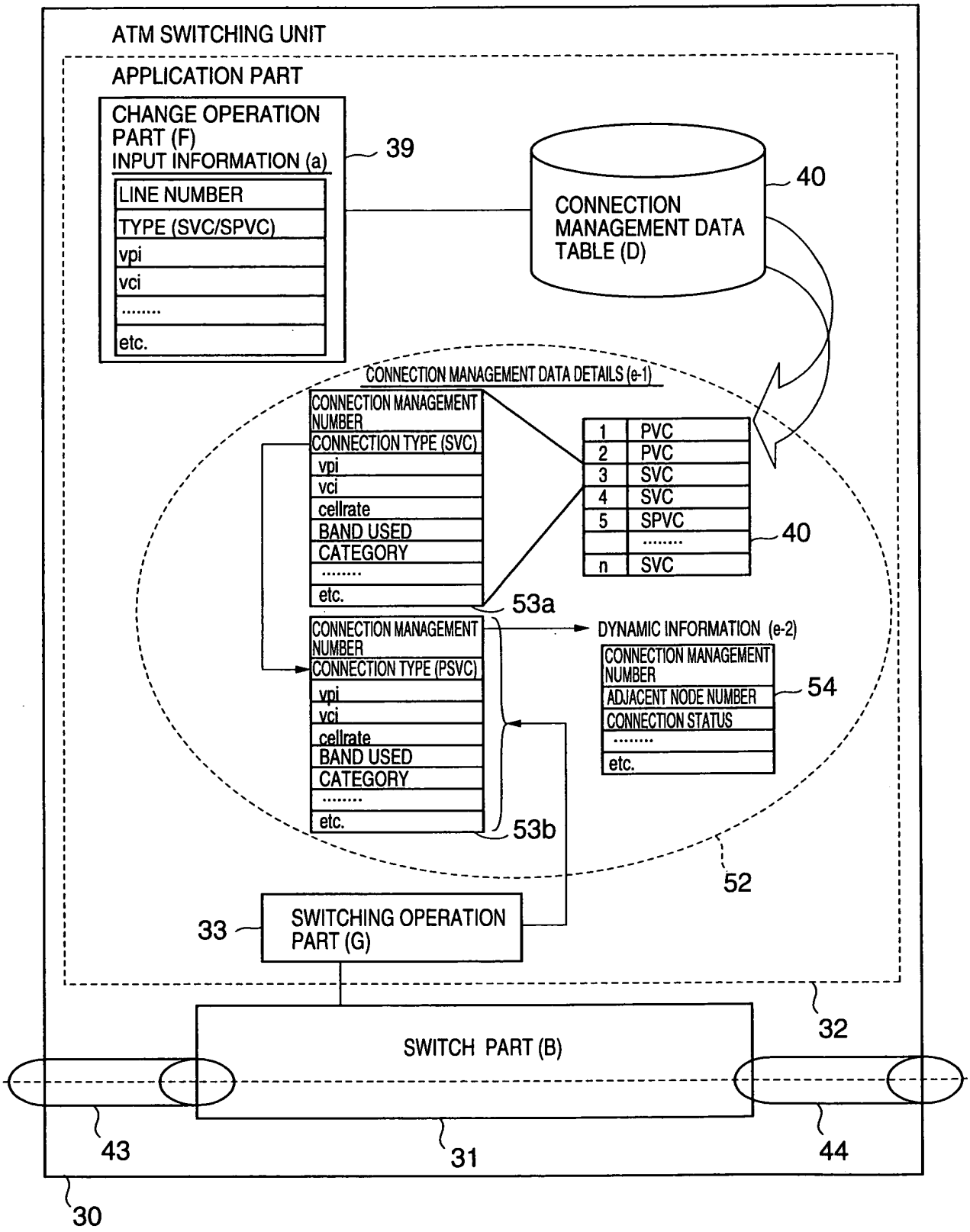

ATM SWITCHING UNIT
APPLICATION PART
CHANGE OPERATION PART (F)
INPUT INFORMATION (a)
LINE NUMBER
TYPE (SVC/SPVC)
vpi
vci
.....
etc.
39
CONNECTION MANAGEMENT DATA TABLE (D)
40
CONNECTION MANAGEMENT DATA DETAILS (e-1)
CONNECTION MANAGEMENT NUMBER
CONNECTION TYPE (SVC)
vpi
vci
cellrate
BAND USED
CATEGORY
.....
etc.
1 PVC
2 PVC
3 SVC
4 SVC
5 SPVC
.....
n SVC
40
53a
CONNECTION MANAGEMENT NUMBER
CONNECTION TYPE (PSVC)
vpi
vci
cellrate
BAND USED
CATEGORY
.....
etc.
53b
DYNAMIC INFORMATION (e-2)
CONNECTION MANAGEMENT NUMBER
ADJACENT NODE NUMBER
CONNECTION STATUS
.....
etc.
54
52
33
SWITCHING OPERATION PART (G)
32
SWITCH PART (B)
43
31
44
30

FIG.6

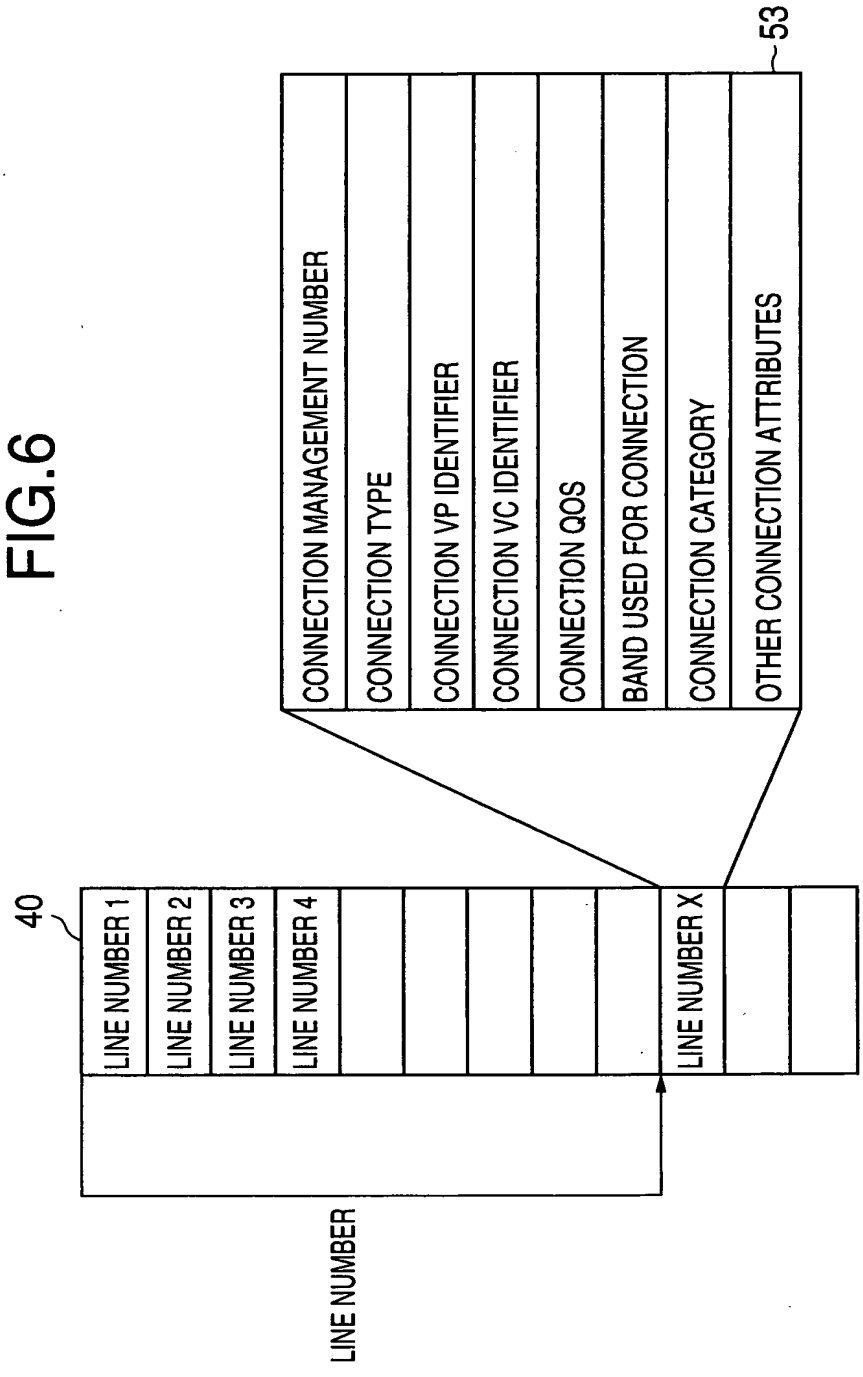

40
LINE NUMBER 1
LINE NUMBER 2
LINE NUMBER 3
LINE NUMBER 4
LINE NUMBER X
LINE NUMBER
53
CONNECTION MANAGEMENT NUMBER
CONNECTION TYPE
CONNECTION VP IDENTIFIER
CONNECTION VC IDENTIFIER
CONNECTION QOS
BAND USED FOR CONNECTION
CONNECTION CATEGORY
OTHER CONNECTION ATTRIBUTES

FIG.7

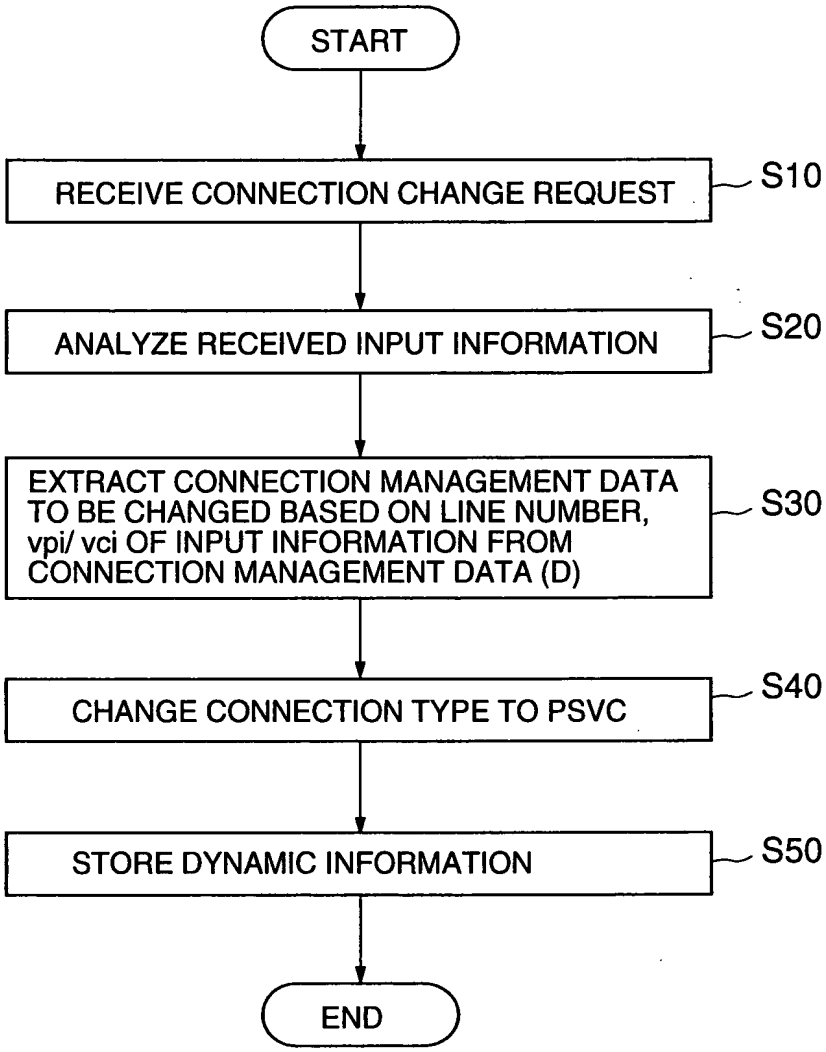

START
RECEIVE CONNECTION CHANGE REQUEST
S10
ANALYZE RECEIVED INPUT INFORMATION
S20
EXTRACT CONNECTION MANAGEMENT DATA TO BE CHANGED BASED ON LINE NUMBER, vpi/ vci OF INPUT INFORMATION FROM CONNECTION MANAGEMENT DATA (D)
S30
CHANGE CONNECTION TYPE TO PSVC
S40
STORE DYNAMIC INFORMATION
S50
END

FIG.8

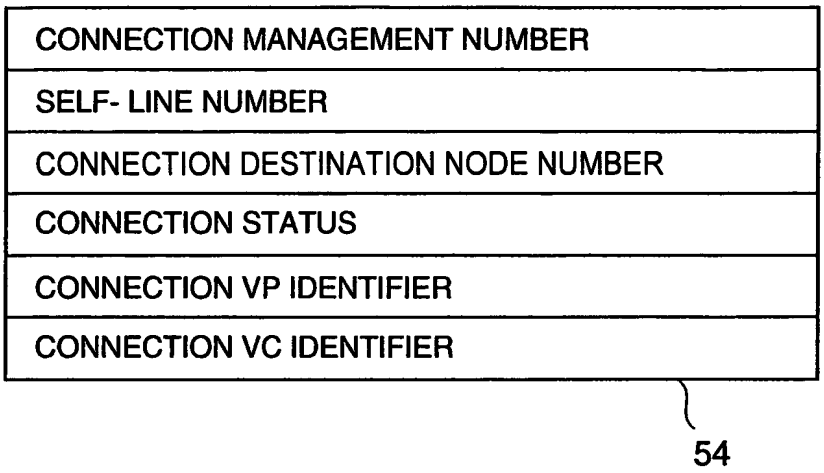

CONNECTION MANAGEMENT NUMBER
SELF- LINE NUMBER
CONNECTION DESTINATION NODE NUMBER
CONNECTION STATUS
CONNECTION VP IDENTIFIER
CONNECTION VC IDENTIFIER
54

FIG.9A

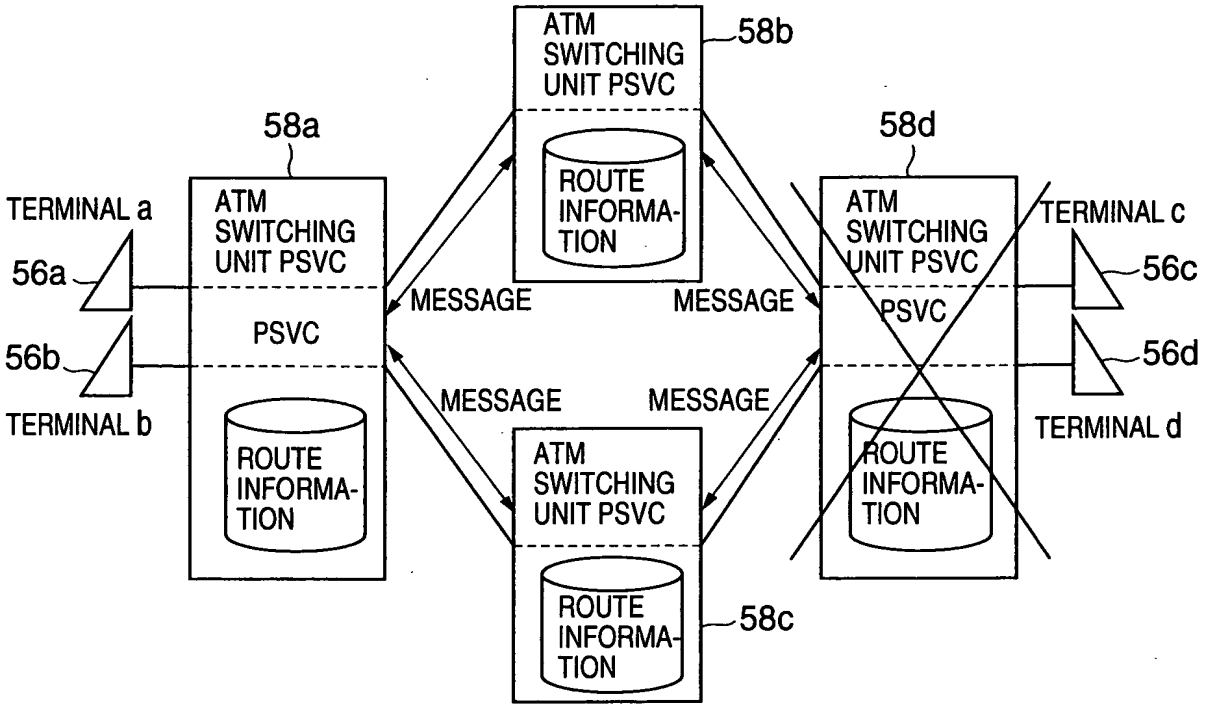

ATM SWITCHING UNIT PSVC
58b
58a
58d
ROUTE INFORMA-TION
TERMINAL a
ATM SWITCHING UNIT PSVC
TERMINAL c
56a
56c
MESSAGE
MESSAGE
PSVC
56b
56d
MESSAGE
MESSAGE
TERMINAL b
ATM SWITCHING UNIT PSVC
TERMINAL d
ROUTE INFORMA-TION
ROUTE INFORMA-TION
ROUTE INFORMA-TION
58c

FIG.9B

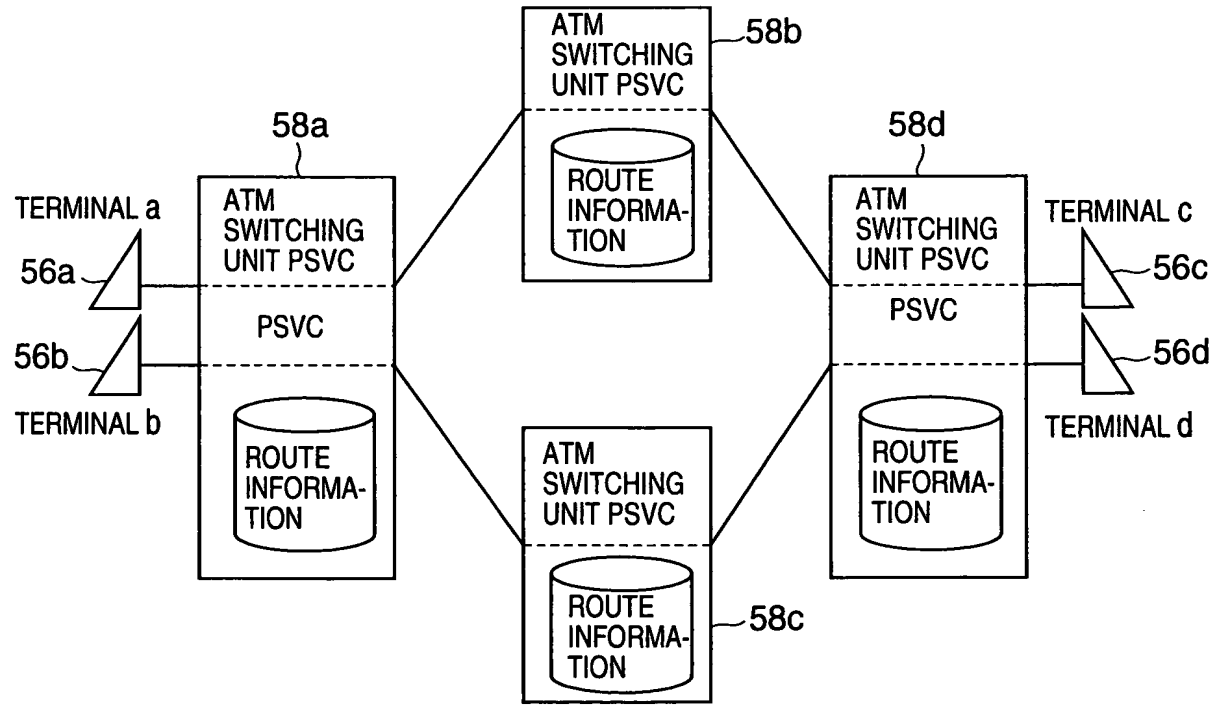

ATM SWITCHING UNIT PSVC
58b
58a
58d
ROUTE INFORMA-TION
TERMINAL a
ATM SWITCHING UNIT PSVC
TERMINAL c
56a
56c
PSVC
56b
56d
TERMINAL b
ATM SWITCHING UNIT PSVC
TERMINAL d
ROUTE INFORMA-TION
ROUTE INFORMA-TION
ROUTE INFORMA-TION
58c

FIG.10

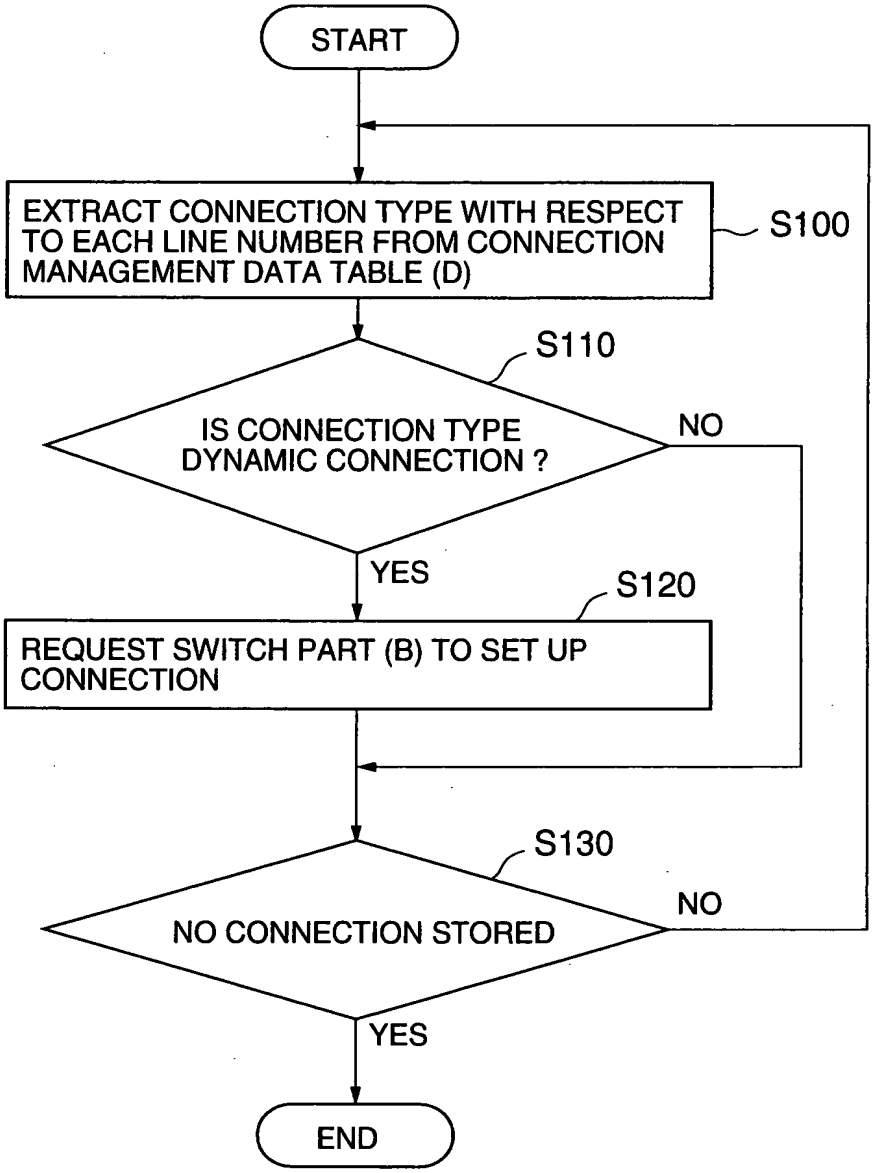

START
EXTRACT CONNECTION TYPE WITH RESPECT TO EACH LINE NUMBER FROM CONNECTION MANAGEMENT DATA TABLE (D)
S100
S110
IS CONNECTION TYPE DYNAMIC CONNECTION ?
NO
YES
S120
REQUEST SWITCH PART (B) TO SET UP CONNECTION
S130
NO CONNECTION STORED
NO
YES
END

FIG.11

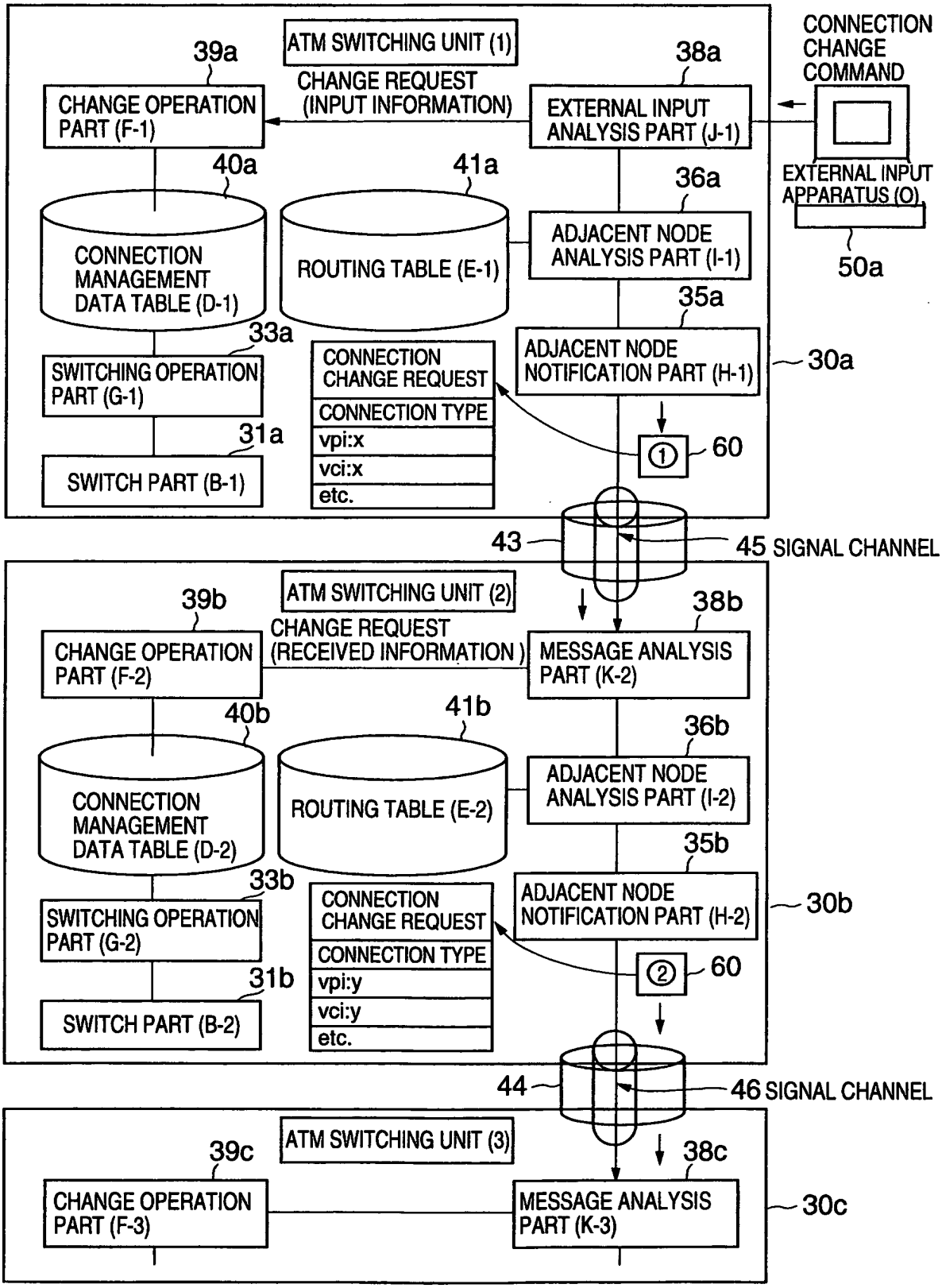

ATM SWITCHING UNIT (1)
39a
CHANGE OPERATION PART (F-1)
CHANGE REQUEST (INPUT INFORMATION)
38a
EXTERNAL INPUT ANALYSIS PART (J-1)
CONNECTION CHANGE COMMAND
EXTERNAL INPUT APPARATUS (O)
50a
40a
CONNECTION MANAGEMENT DATA TABLE (D-1)
41a
ROUTING TABLE (E-1)
36a
ADJACENT NODE ANALYSIS PART (I-1)
35a
33a
SWITCHING OPERATION PART (G-1)
CONNECTION CHANGE REQUEST
CONNECTION TYPE
vpi:x
vci:x
etc.
ADJACENT NODE NOTIFICATION PART (H-1)
30a
31a
SWITCH PART (B-1)
①
60
43
45 SIGNAL CHANNEL
ATM SWITCHING UNIT (2)
39b
CHANGE OPERATION PART (F-2)
CHANGE REQUEST (RECEIVED INFORMATION)
38b
MESSAGE ANALYSIS PART (K-2)
40b
CONNECTION MANAGEMENT DATA TABLE (D-2)
41b
ROUTING TABLE (E-2)
36b
ADJACENT NODE ANALYSIS PART (I-2)
35b
33b
SWITCHING OPERATION PART (G-2)
CONNECTION CHANGE REQUEST
CONNECTION TYPE
vpi:y
vci:y
etc.
ADJACENT NODE NOTIFICATION PART (H-2)
30b
31b
SWITCH PART (B-2)
②
60
44
46 SIGNAL CHANNEL
ATM SWITCHING UNIT (3)
39c
CHANGE OPERATION PART (F-3)
38c
MESSAGE ANALYSIS PART (K-3)
30c

FIG.12

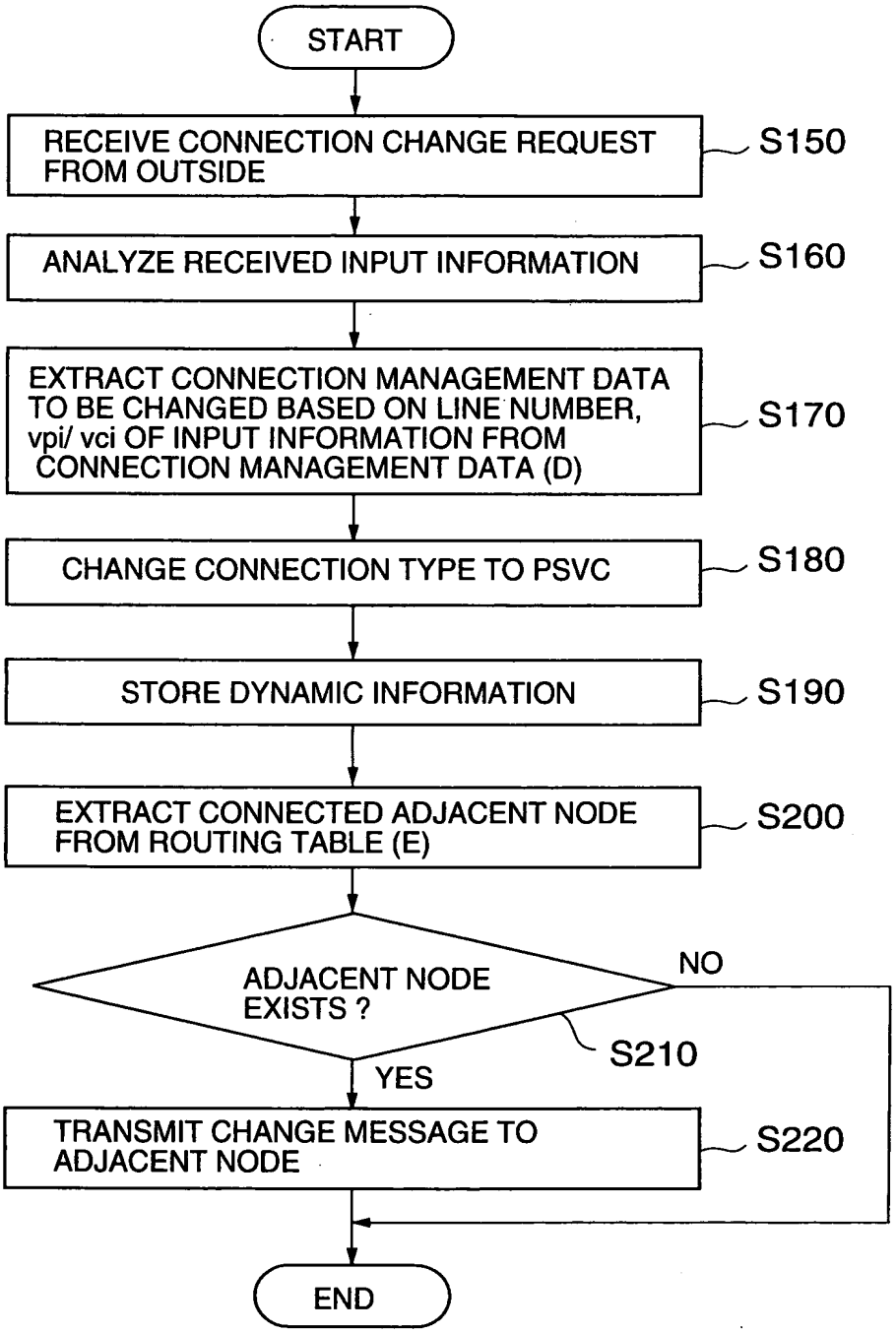

START
RECEIVE CONNECTION CHANGE REQUEST FROM OUTSIDE
S150
ANALYZE RECEIVED INPUT INFORMATION
S160
EXTRACT CONNECTION MANAGEMENT DATA TO BE CHANGED BASED ON LINE NUMBER, vpi/ vci OF INPUT INFORMATION FROM CONNECTION MANAGEMENT DATA (D)
S170
CHANGE CONNECTION TYPE TO PSVC
S180
STORE DYNAMIC INFORMATION
S190
EXTRACT CONNECTED ADJACENT NODE FROM ROUTING TABLE (E)
S200
ADJACENT NODE EXISTS ?
NO
S210
YES
TRANSMIT CHANGE MESSAGE TO ADJACENT NODE
S220
END

FIG.13

REQUEST INFORMATION HEADER
MESSAGE TYPE 1: CHANGE REQUEST 2: RELEASE REQUEST
AUTOMATIC- CHANGE - ENABLED LINE NUMBER
AUTOMATIC CHANGE CONNECTION TYPE
vpi
vci
ADDITIONAL INFORMATION

FIG.14

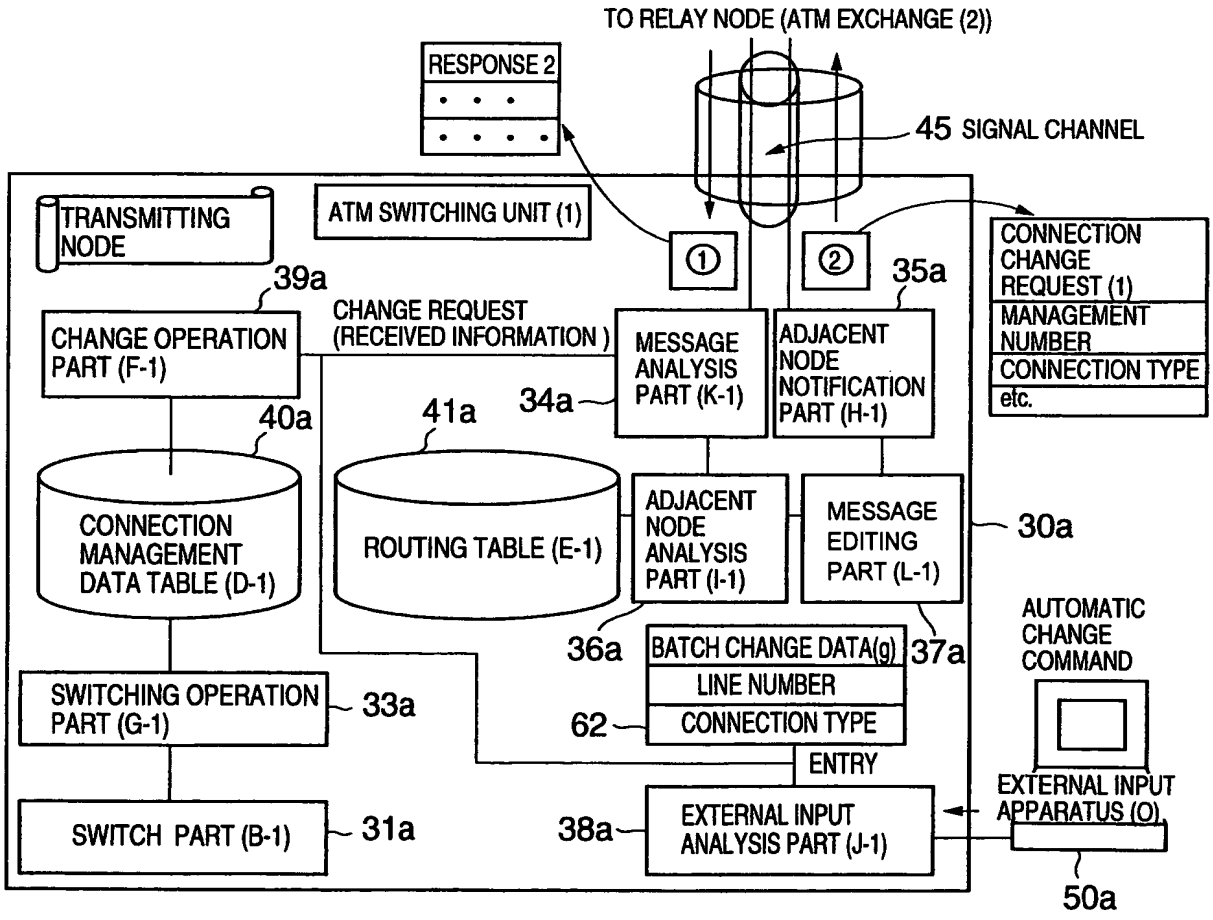


FIG.15

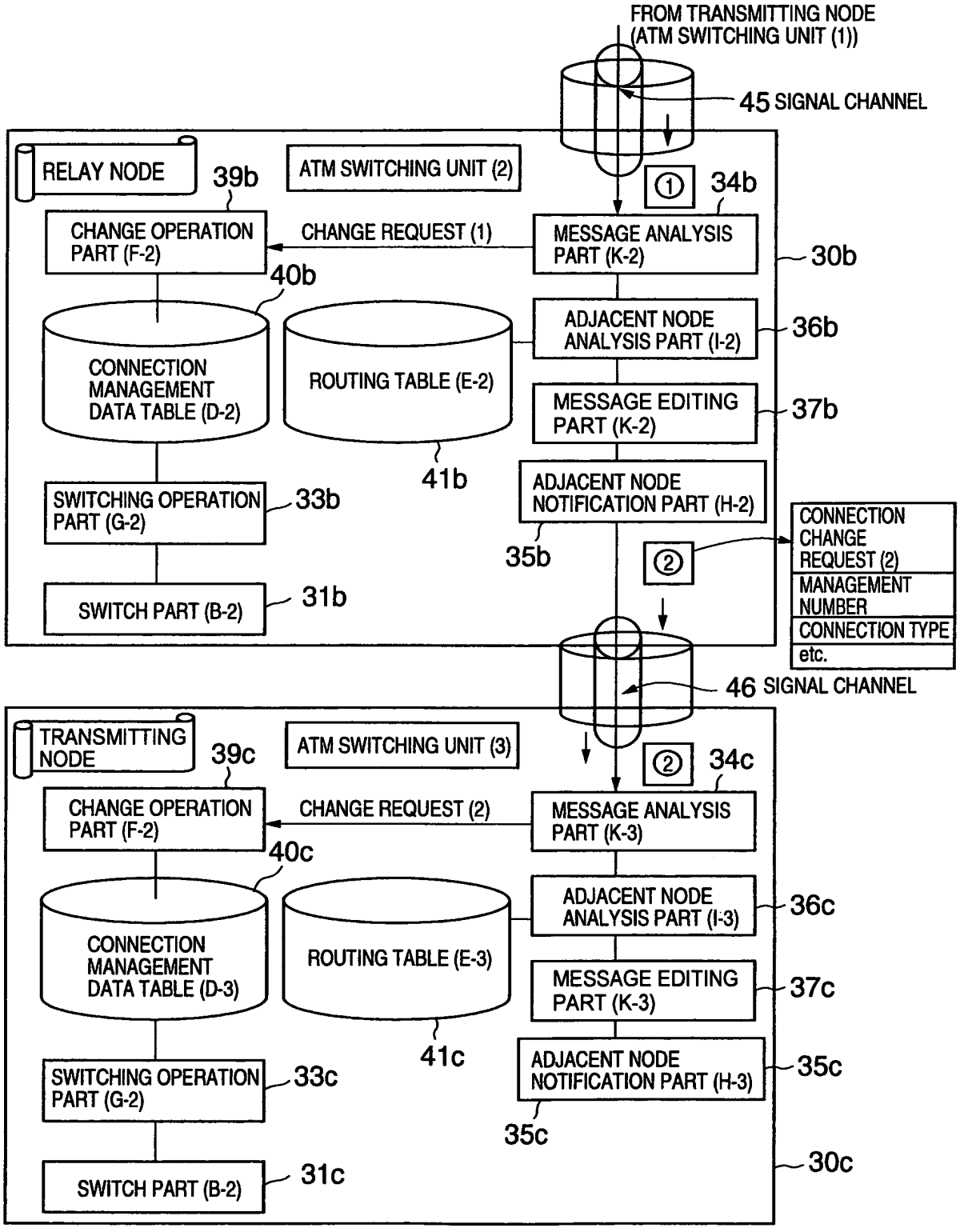

FROM TRANSMITTING NODE
(ATM SWITCHING UNIT (1))
45 SIGNAL CHANNEL
RELAY NODE
39b
ATM SWITCHING UNIT (2)
①
34b
CHANGE OPERATION PART (F-2)
CHANGE REQUEST (1)
MESSAGE ANALYSIS PART (K-2)
30b
40b
CONNECTION MANAGEMENT DATA TABLE (D-2)
ROUTING TABLE (E-2)
ADJACENT NODE ANALYSIS PART (I-2)
36b
MESSAGE EDITING PART (K-2)
37b
41b
SWITCHING OPERATION PART (G-2)
33b
ADJACENT NODE NOTIFICATION PART (H-2)
35b
②
CONNECTION CHANGE REQUEST (2)
MANAGEMENT NUMBER
CONNECTION TYPE
etc.
SWITCH PART (B-2)
31b
46 SIGNAL CHANNEL
TRANSMITTING NODE
39c
ATM SWITCHING UNIT (3)
②
34c
CHANGE OPERATION PART (F-2)
CHANGE REQUEST (2)
MESSAGE ANALYSIS PART (K-3)
40c
CONNECTION MANAGEMENT DATA TABLE (D-3)
ROUTING TABLE (E-3)
ADJACENT NODE ANALYSIS PART (I-3)
36c
MESSAGE EDITING PART (K-3)
37c
41c
SWITCHING OPERATION PART (G-2)
33c
ADJACENT NODE NOTIFICATION PART (H-3)
35c
35c
SWITCH PART (B-2)
31c
30c

FIG.16

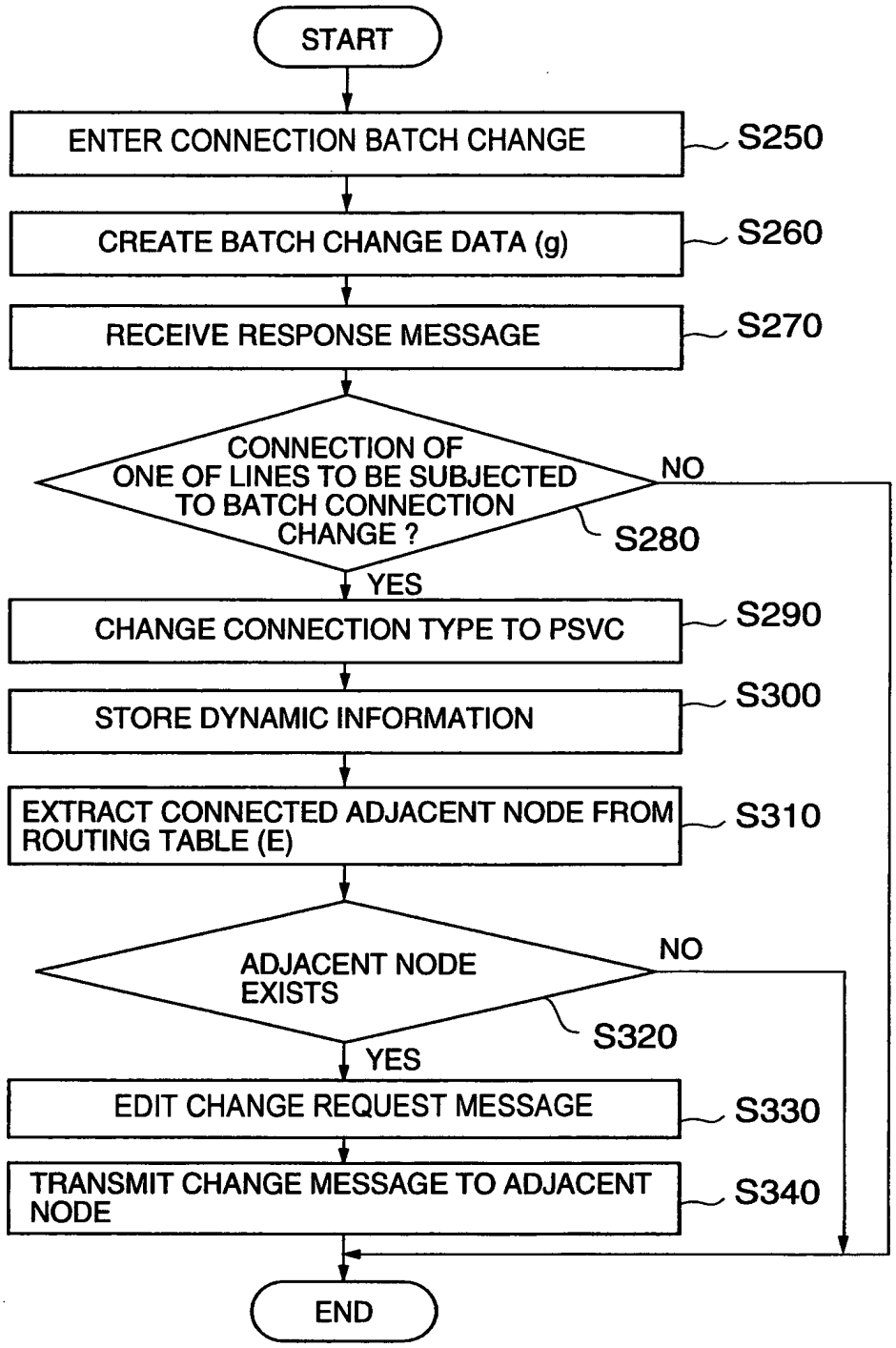

START
ENTER CONNECTION BATCH CHANGE
S250
CREATE BATCH CHANGE DATA (g)
S260
RECEIVE RESPONSE MESSAGE
S270
CONNECTION OF ONE OF LINES TO BE SUBJECTED TO BATCH CONNECTION CHANGE ?
S280
NO
YES
CHANGE CONNECTION TYPE TO PSVC
S290
STORE DYNAMIC INFORMATION
S300
EXTRACT CONNECTED ADJACENT NODE FROM ROUTING TABLE (E)
S310
ADJACENT NODE EXISTS
S320
NO
YES
EDIT CHANGE REQUEST MESSAGE
S330
TRANSMIT CHANGE MESSAGE TO ADJACENT NODE
S340
END

FIG.17

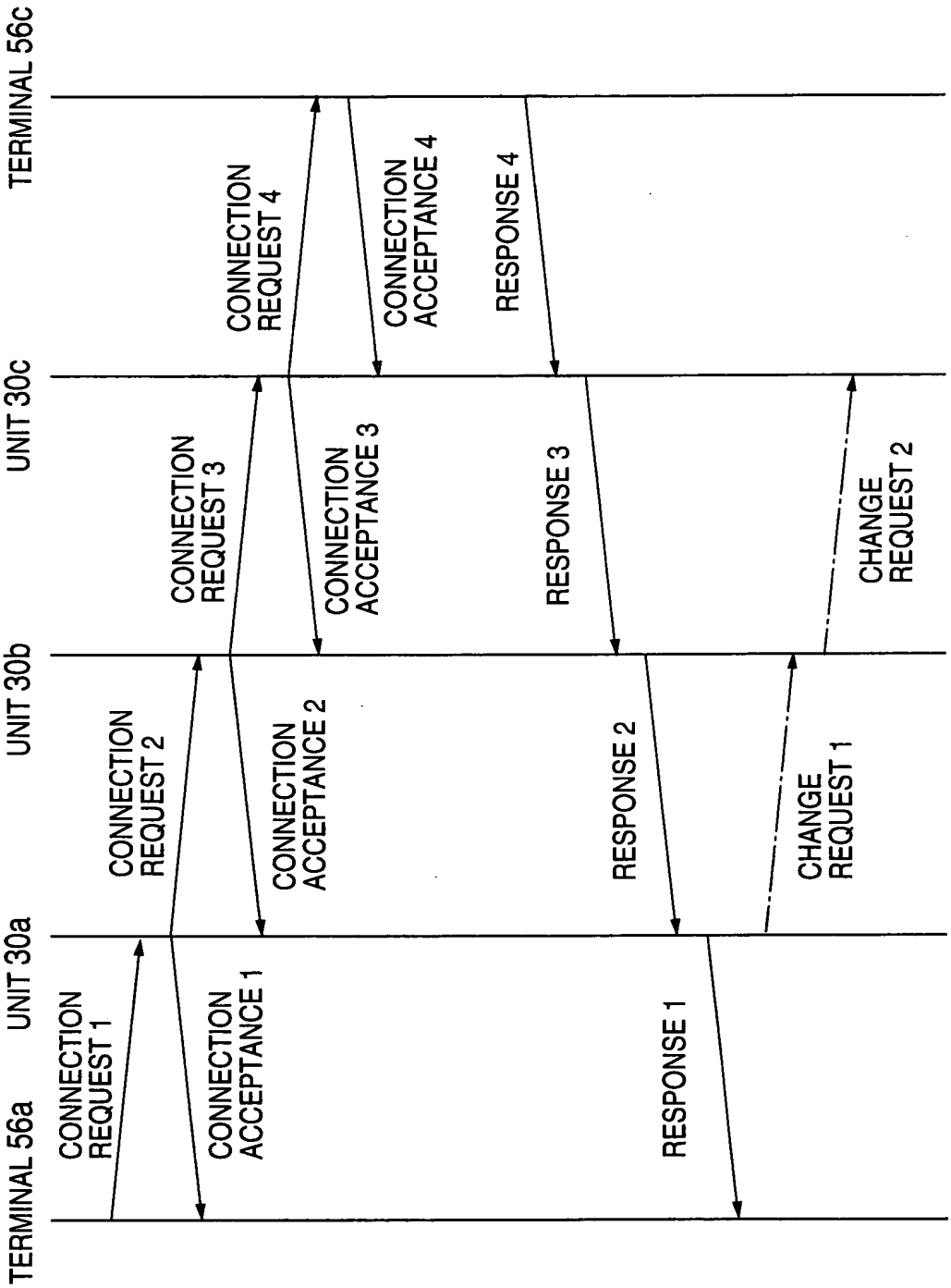

TERMINAL 56a
ATM SWITCHING UNIT 30a
ATM SWITCHING UNIT 30b
ATM SWITCHING UNIT 30c
TERMINAL 56c
CONNECTION REQUEST 1
CONNECTION ACCEPTANCE 1
CONNECTION REQUEST 2
CONNECTION ACCEPTANCE 2
CONNECTION REQUEST 3
CONNECTION ACCEPTANCE 3
CONNECTION REQUEST 4
CONNECTION ACCEPTANCE 4
RESPONSE 1
RESPONSE 2
RESPONSE 3
RESPONSE 4
CHANGE REQUEST 1
CHANGE REQUEST 2

FIG.18

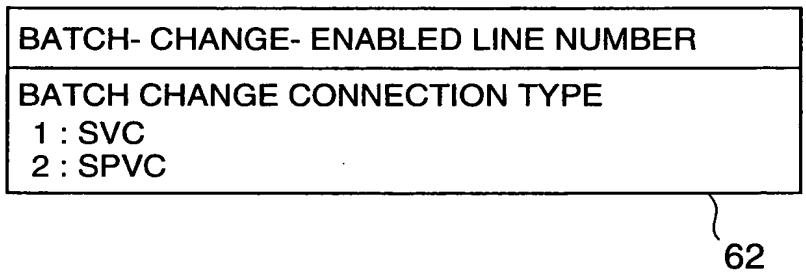

BATCH- CHANGE- ENABLED LINE NUMBER
BATCH CHANGE CONNECTION TYPE
1 : SVC
2 : SPVC
62

FIG.19

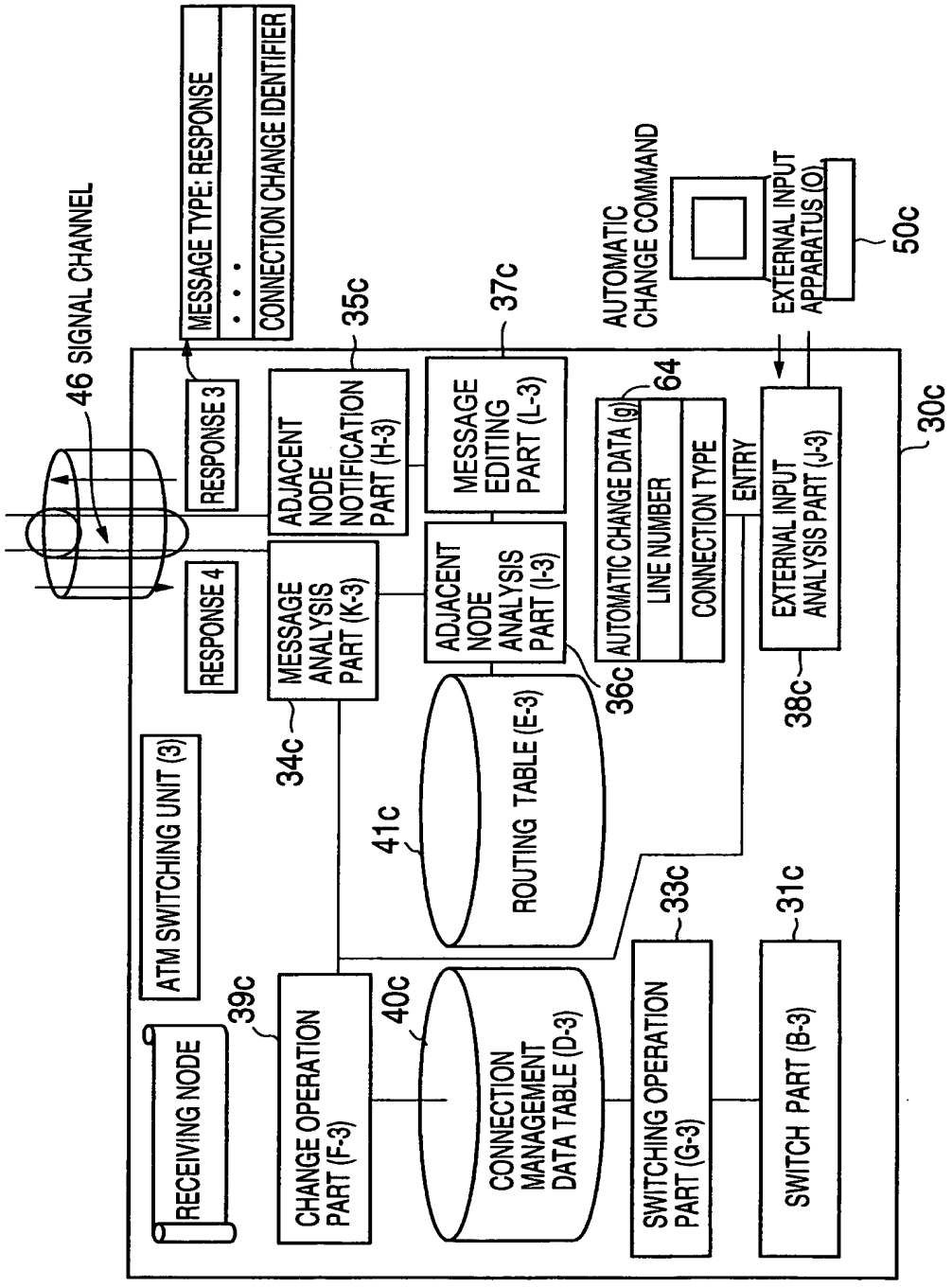

46 SIGNAL CHANNEL
MESSAGE TYPE: RESPONSE
CONNECTION CHANGE IDENTIFIER
RESPONSE 3
RESPONSE 4
ADJACENT NODE NOTIFICATION PART (H-3)
35c
MESSAGE EDITING PART (L-3)
37c
AUTOMATIC CHANGE COMMAND
EXTERNAL INPUT APPARATUS (O)
50c
64
AUTOMATIC CHANGE DATA (g)
LINE NUMBER
CONNECTION TYPE
ENTRY
30c
MESSAGE ANALYSIS PART (K-3)
ADJACENT NODE ANALYSIS PART (I-3)
36c
EXTERNAL INPUT ANALYSIS PART (J-3)
38c
34c
41c
ROUTING TABLE (E-3)
ATM SWITCHING UNIT (3)
RECEIVING NODE
39c
CHANGE OPERATION PART (F-3)
40c
CONNECTION MANAGEMENT DATA TABLE (D-3)
33c
SWITCHING OPERATION PART (G-3)
31c
SWITCH PART (B-3)

FIG.20

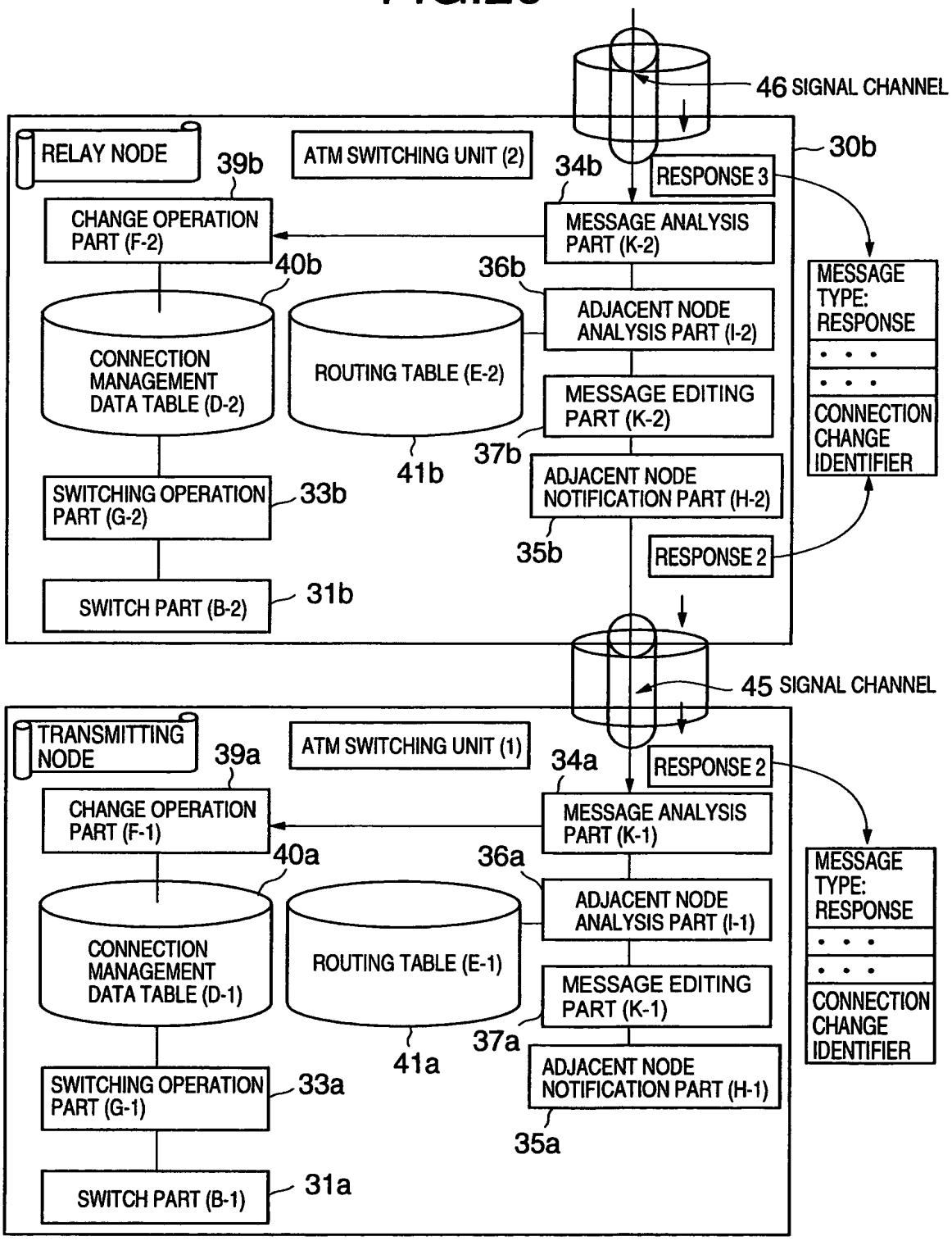

46 SIGNAL CHANNEL
RELAY NODE
39b
ATM SWITCHING UNIT (2)
34b
RESPONSE 3
30b
CHANGE OPERATION PART (F-2)
MESSAGE ANALYSIS PART (K-2)
40b
36b
MESSAGE TYPE: RESPONSE
CONNECTION MANAGEMENT DATA TABLE (D-2)
ROUTING TABLE (E-2)
ADJACENT NODE ANALYSIS PART (I-2)
MESSAGE EDITING PART (K-2)
37b
41b
CONNECTION CHANGE IDENTIFIER
SWITCHING OPERATION PART (G-2)
33b
ADJACENT NODE NOTIFICATION PART (H-2)
35b
RESPONSE 2
SWITCH PART (B-2)
31b
45 SIGNAL CHANNEL
TRANSMITTING NODE
39a
ATM SWITCHING UNIT (1)
34a
RESPONSE 2
CHANGE OPERATION PART (F-1)
MESSAGE ANALYSIS PART (K-1)
40a
36a
MESSAGE TYPE: RESPONSE
CONNECTION MANAGEMENT DATA TABLE (D-1)
ROUTING TABLE (E-1)
ADJACENT NODE ANALYSIS PART (I-1)
MESSAGE EDITING PART (K-1)
37a
41a
CONNECTION CHANGE IDENTIFIER
SWITCHING OPERATION PART (G-1)
33a
ADJACENT NODE NOTIFICATION PART (H-1)
35a
SWITCH PART (B-1)
31a

FIG.21

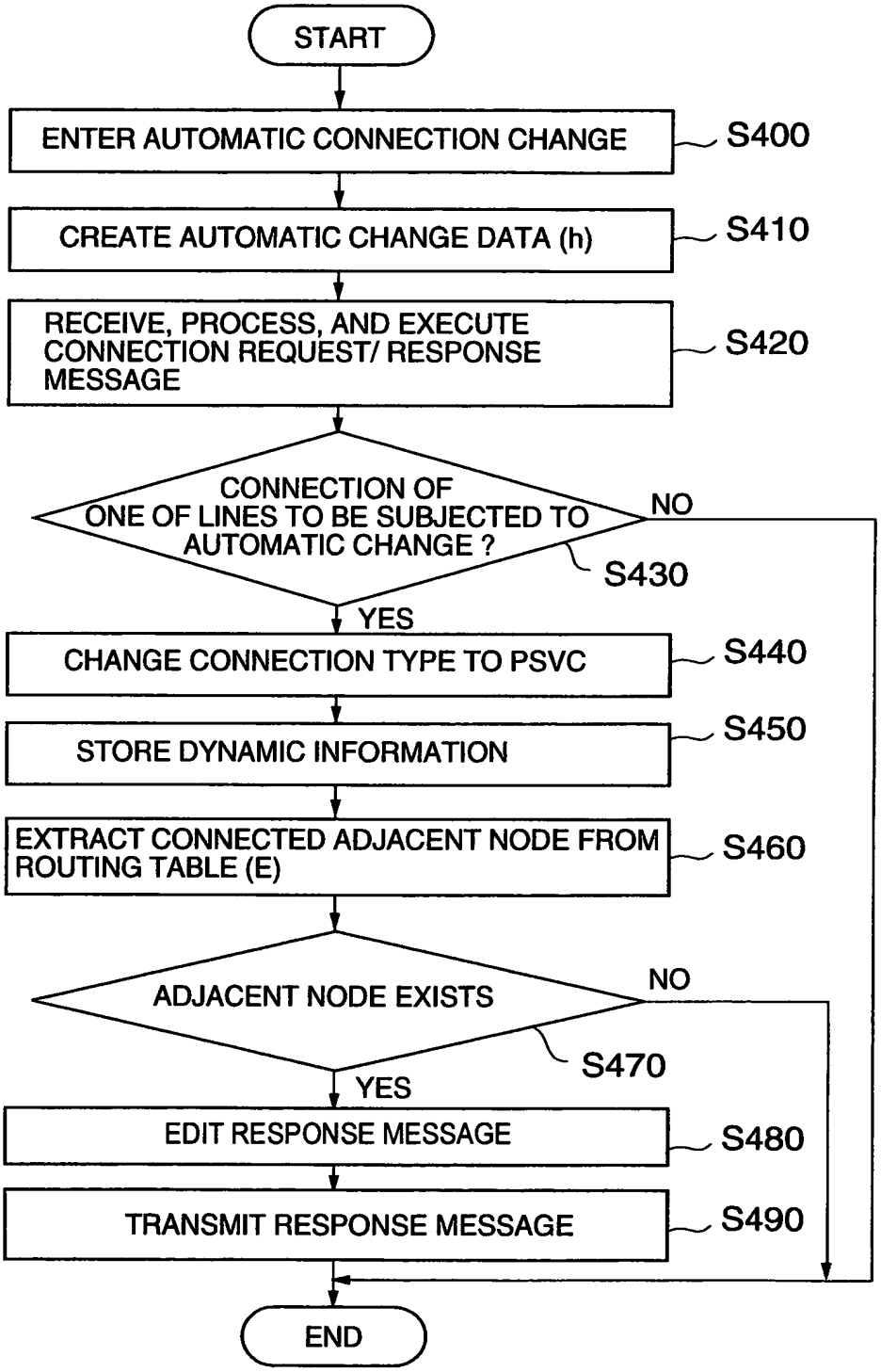

START
ENTER AUTOMATIC CONNECTION CHANGE
S400
CREATE AUTOMATIC CHANGE DATA (h)
S410
RECEIVE, PROCESS, AND EXECUTE CONNECTION REQUEST/ RESPONSE MESSAGE
S420
CONNECTION OF ONE OF LINES TO BE SUBJECTED TO AUTOMATIC CHANGE ?
NO
S430
YES
CHANGE CONNECTION TYPE TO PSVC
S440
STORE DYNAMIC INFORMATION
S450
EXTRACT CONNECTED ADJACENT NODE FROM ROUTING TABLE (E)
S460
ADJACENT NODE EXISTS
NO
S470
YES
EDIT RESPONSE MESSAGE
S480
TRANSMIT RESPONSE MESSAGE
S490
END

FIG.22

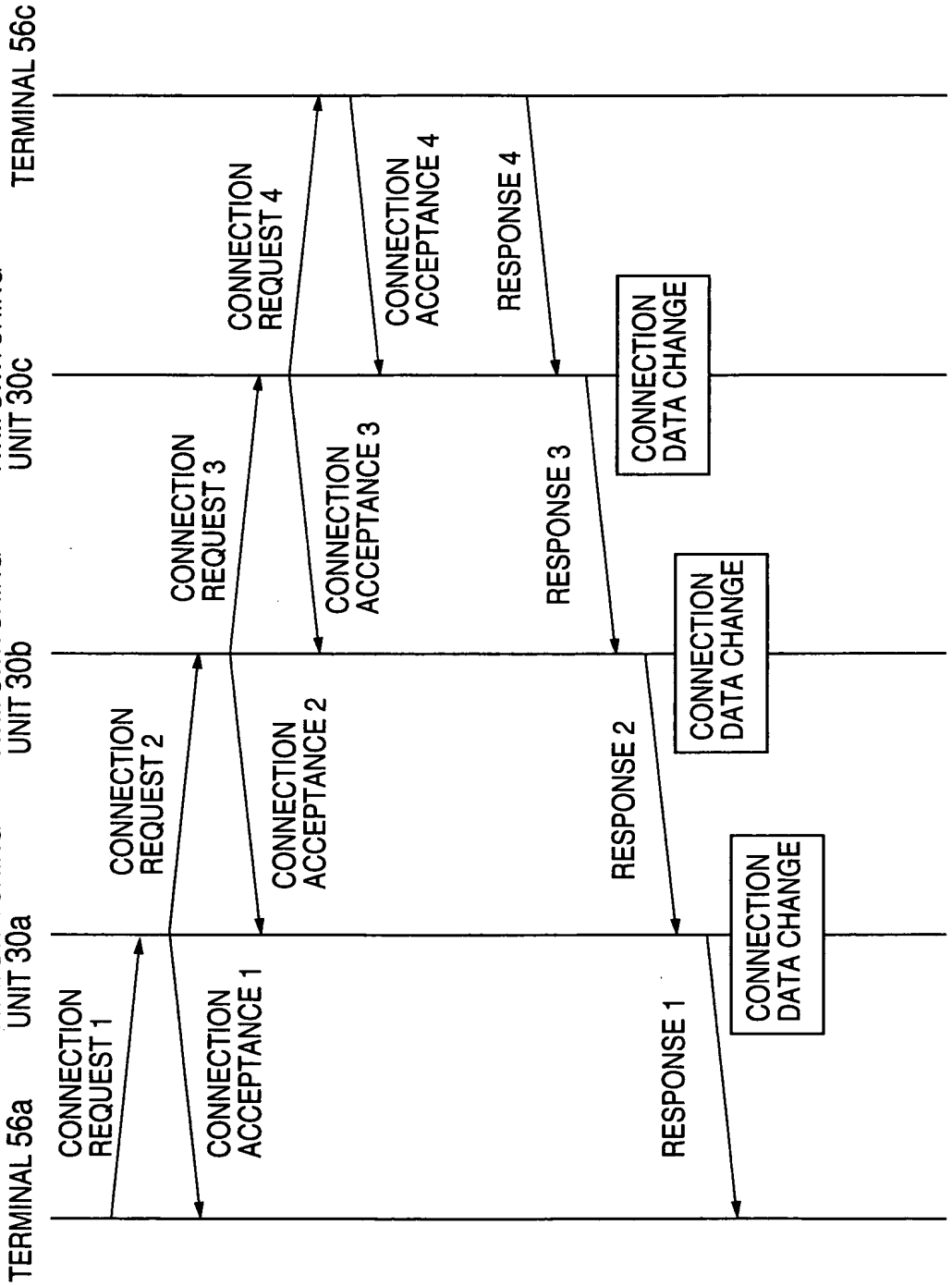

TERMINAL 56a
ATM SWITCHING UNIT 30a
ATM SWITCHING UNIT 30b
ATM SWITCHING UNIT 30c
TERMINAL 56c
CONNECTION REQUEST 1
CONNECTION ACCEPTANCE 1
CONNECTION REQUEST 2
CONNECTION ACCEPTANCE 2
CONNECTION REQUEST 3
CONNECTION ACCEPTANCE 3
CONNECTION REQUEST 4
CONNECTION ACCEPTANCE 4
RESPONSE 1
RESPONSE 2
RESPONSE 3
RESPONSE 4
CONNECTION DATA CHANGE
CONNECTION DATA CHANGE
CONNECTION DATA CHANGE

FIG.23

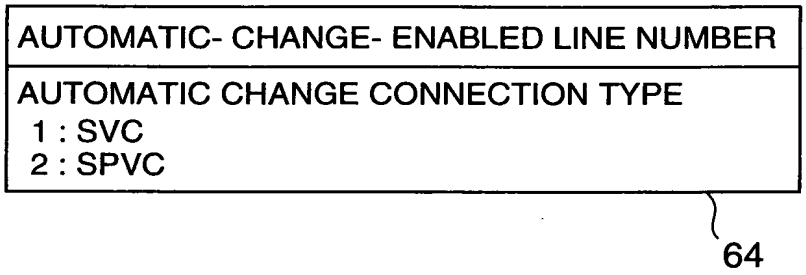

AUTOMATIC- CHANGE- ENABLED LINE NUMBER
AUTOMATIC CHANGE CONNECTION TYPE
1 : SVC
2 : SPVC
64

FIG.24

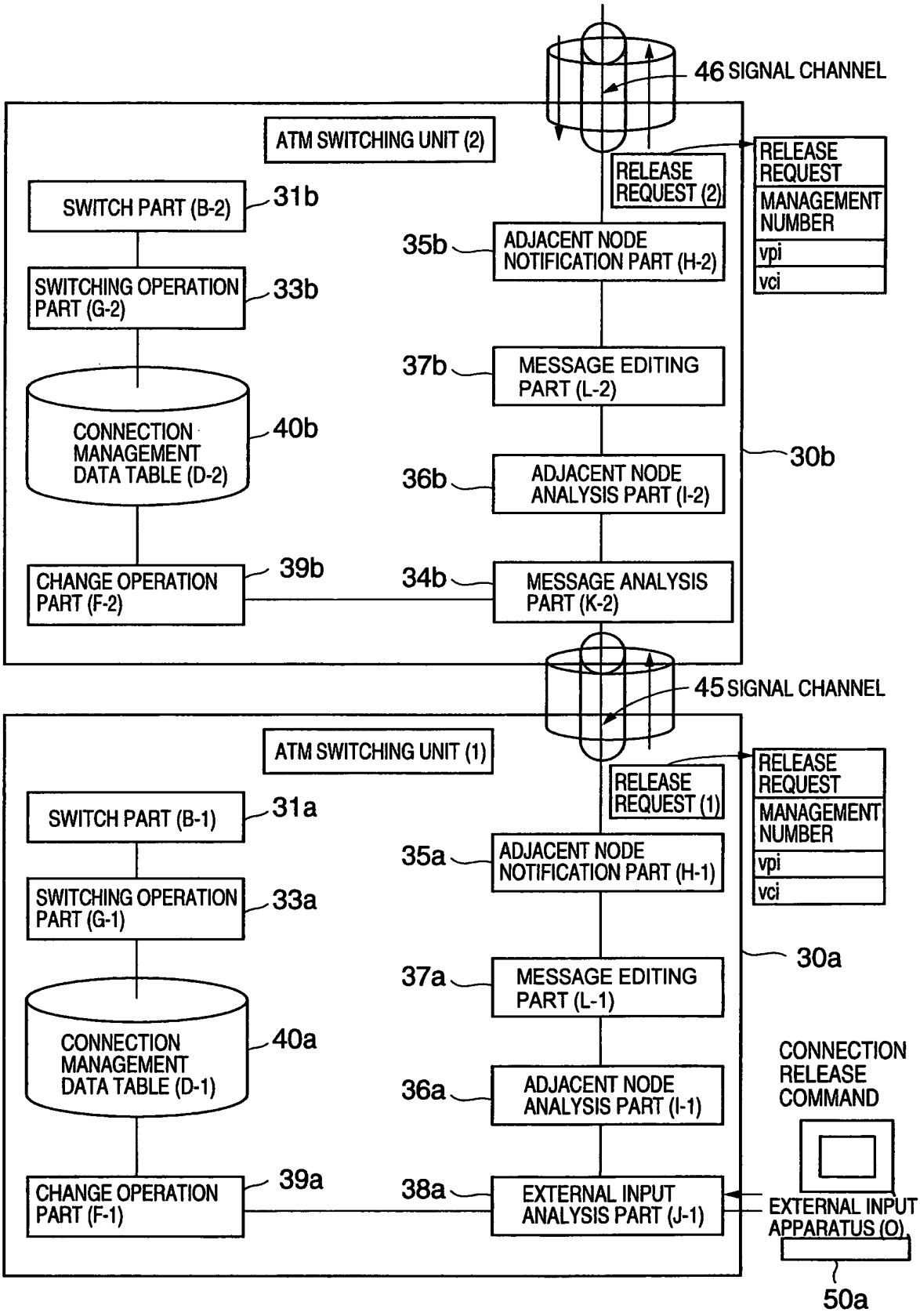

46 SIGNAL CHANNEL
ATM SWITCHING UNIT (2)
SWITCH PART (B-2)
31b
SWITCHING OPERATION PART (G-2)
33b
CONNECTION MANAGEMENT DATA TABLE (D-2)
40b
CHANGE OPERATION PART (F-2)
39b
RELEASE REQUEST (2)
RELEASE REQUEST
MANAGEMENT NUMBER
vpi
vci
35b
ADJACENT NODE NOTIFICATION PART (H-2)
37b
MESSAGE EDITING PART (L-2)
36b
ADJACENT NODE ANALYSIS PART (I-2)
34b
MESSAGE ANALYSIS PART (K-2)
30b
45 SIGNAL CHANNEL
ATM SWITCHING UNIT (1)
SWITCH PART (B-1)
31a
SWITCHING OPERATION PART (G-1)
33a
CONNECTION MANAGEMENT DATA TABLE (D-1)
40a
CHANGE OPERATION PART (F-1)
39a
RELEASE REQUEST (1)
RELEASE REQUEST
MANAGEMENT NUMBER
vpi
vci
35a
ADJACENT NODE NOTIFICATION PART (H-1)
37a
MESSAGE EDITING PART (L-1)
36a
ADJACENT NODE ANALYSIS PART (I-1)
38a
EXTERNAL INPUT ANALYSIS PART (J-1)
30a
CONNECTION RELEASE COMMAND
EXTERNAL INPUT APPARATUS (O)
50a

FIG.25

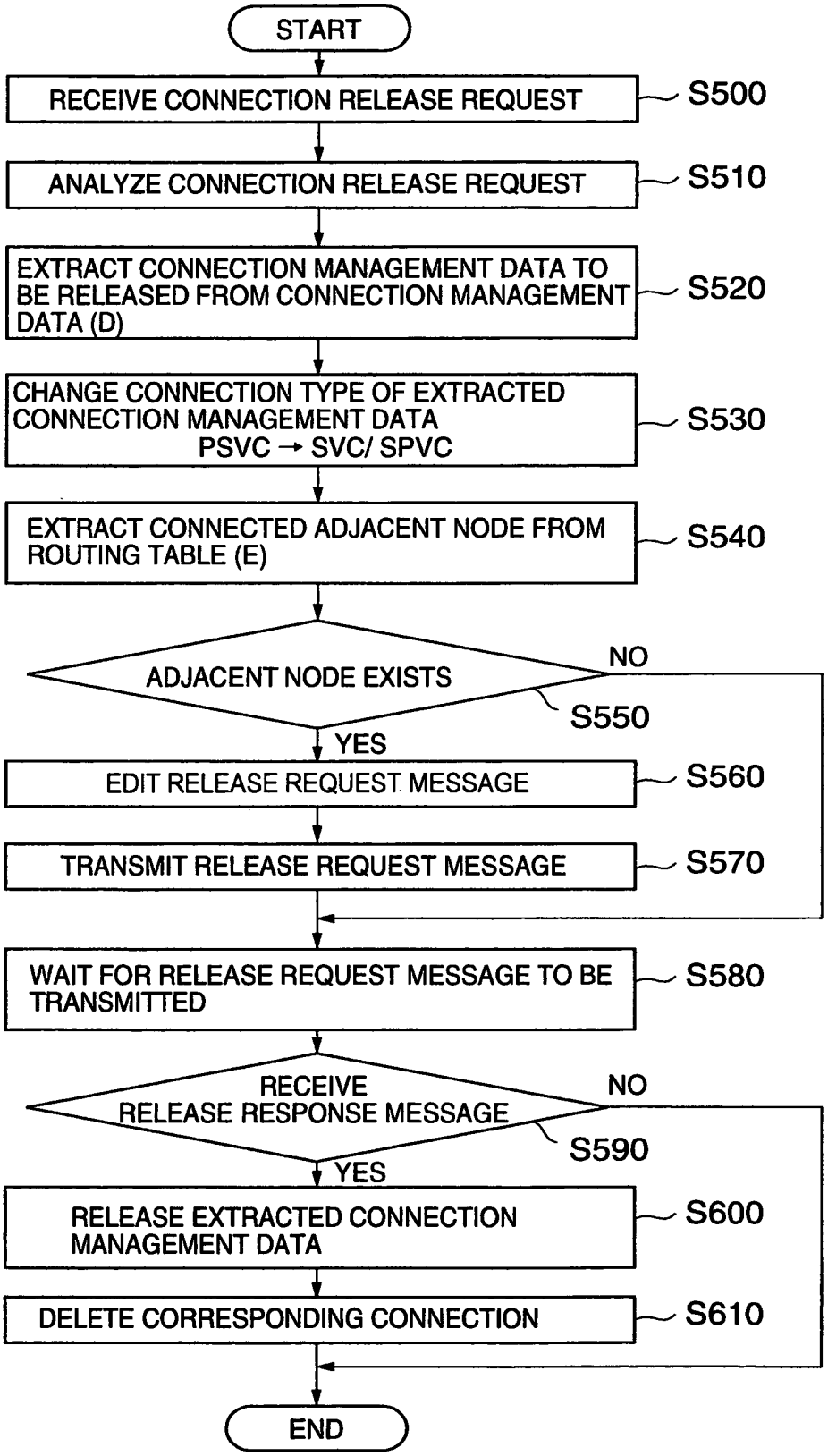

START
RECEIVE CONNECTION RELEASE REQUEST
S500
ANALYZE CONNECTION RELEASE REQUEST
S510
EXTRACT CONNECTION MANAGEMENT DATA TO BE RELEASED FROM CONNECTION MANAGEMENT DATA (D)
S520
CHANGE CONNECTION TYPE OF EXTRACTED CONNECTION MANAGEMENT DATA
PSVC → SVC/ SPVC
S530
EXTRACT CONNECTED ADJACENT NODE FROM ROUTING TABLE (E)
S540
ADJACENT NODE EXISTS
NO
S550
YES
EDIT RELEASE REQUEST MESSAGE
S560
TRANSMIT RELEASE REQUEST MESSAGE
S570
WAIT FOR RELEASE REQUEST MESSAGE TO BE TRANSMITTED
S580
RECEIVE RELEASE RESPONSE MESSAGE
NO
S590
YES
RELEASE EXTRACTED CONNECTION MANAGEMENT DATA
S600
DELETE CORRESPONDING CONNECTION
S610
END

FIG.26

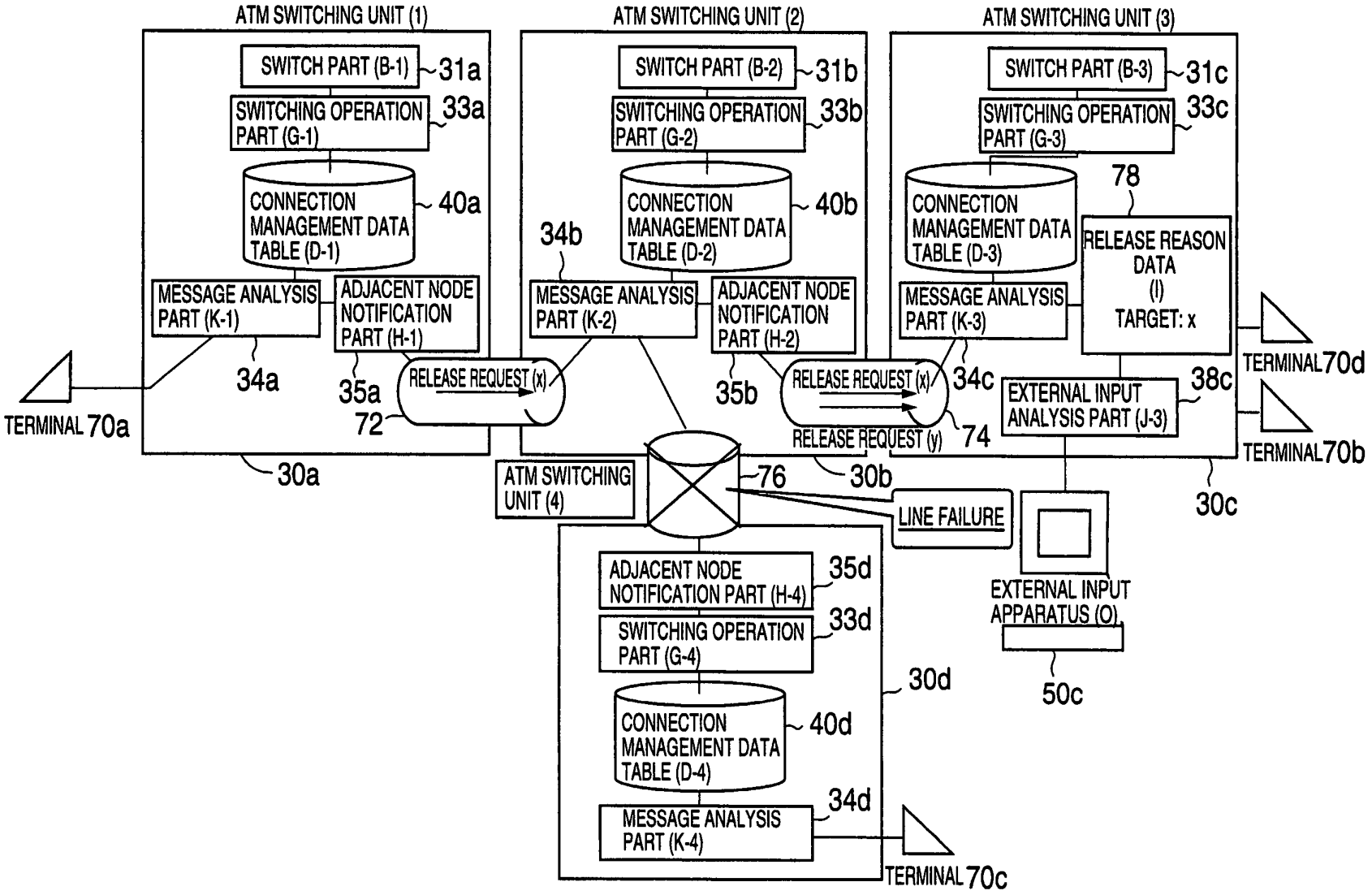

ATM SWITCHING UNIT (1)
ATM SWITCHING UNIT (2)
ATM SWITCHING UNIT (3)
SWITCH PART (B-1)
31a
SWITCH PART (B-2)
31b
SWITCH PART (B-3)
31c
SWITCHING OPERATION PART (G-1)
33a
SWITCHING OPERATION PART (G-2)
33b
SWITCHING OPERATION PART (G-3)
33c
CONNECTION MANAGEMENT DATA TABLE (D-1)
40a
CONNECTION MANAGEMENT DATA TABLE (D-2)
40b
CONNECTION MANAGEMENT DATA TABLE (D-3)
78
RELEASE REASON DATA (I) TARGET: x
34b
MESSAGE ANALYSIS PART (K-1)
ADJACENT NODE NOTIFICATION PART (H-1)
MESSAGE ANALYSIS PART (K-2)
ADJACENT NODE NOTIFICATION PART (H-2)
MESSAGE ANALYSIS PART (K-3)
TERMINAL 70d
34a
35a
RELEASE REQUEST (x)
72
35b
RELEASE REQUEST (x)
34c
EXTERNAL INPUT ANALYSIS PART (J-3)
38c
TERMINAL 70a
RELEASE REQUEST (y)
74
TERMINAL 70b
30a
ATM SWITCHING UNIT (4)
76
30b
30c
LINE FAILURE
ADJACENT NODE NOTIFICATION PART (H-4)
35d
EXTERNAL INPUT APPARATUS (O)
SWITCHING OPERATION PART (G-4)
33d
30d
CONNECTION MANAGEMENT DATA TABLE (D-4)
40d
50c
34d
MESSAGE ANALYSIS PART (K-4)
TERMINAL 70c

FIG.27

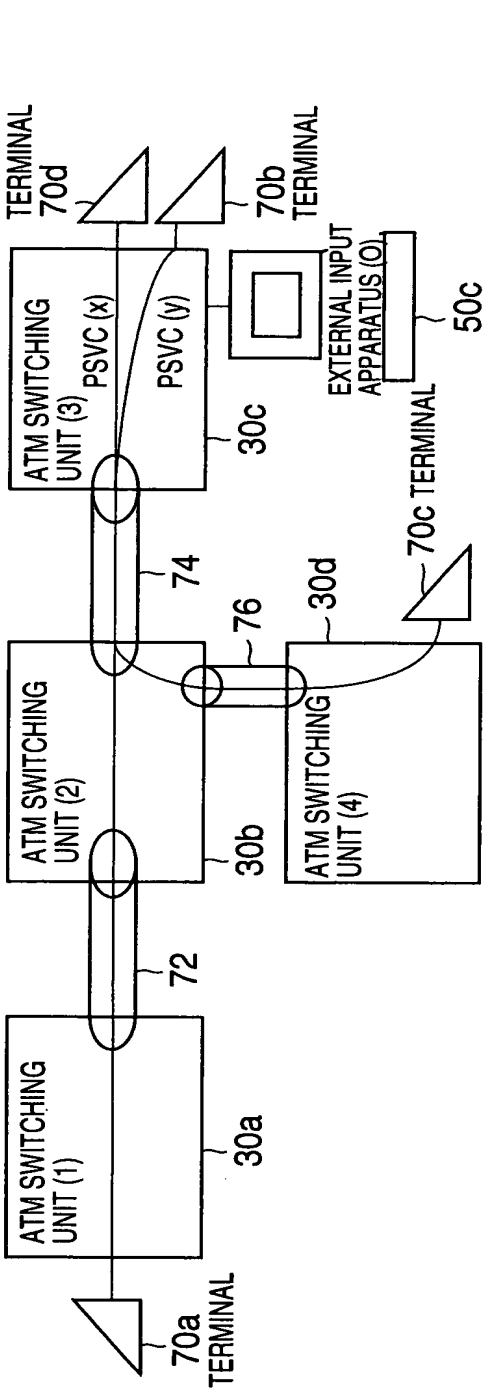

ATM SWITCHING UNIT (1)
30a
70a TERMINAL
72
ATM SWITCHING UNIT (2)
30b
74
76
ATM SWITCHING UNIT (3)
PSVC (x)
PSVC (y)
30c
70d TERMINAL
70b TERMINAL
EXTERNAL INPUT APPARATUS (O)
50c
ATM SWITCHING UNIT (4)
30d
70c TERMINAL

FIG.28

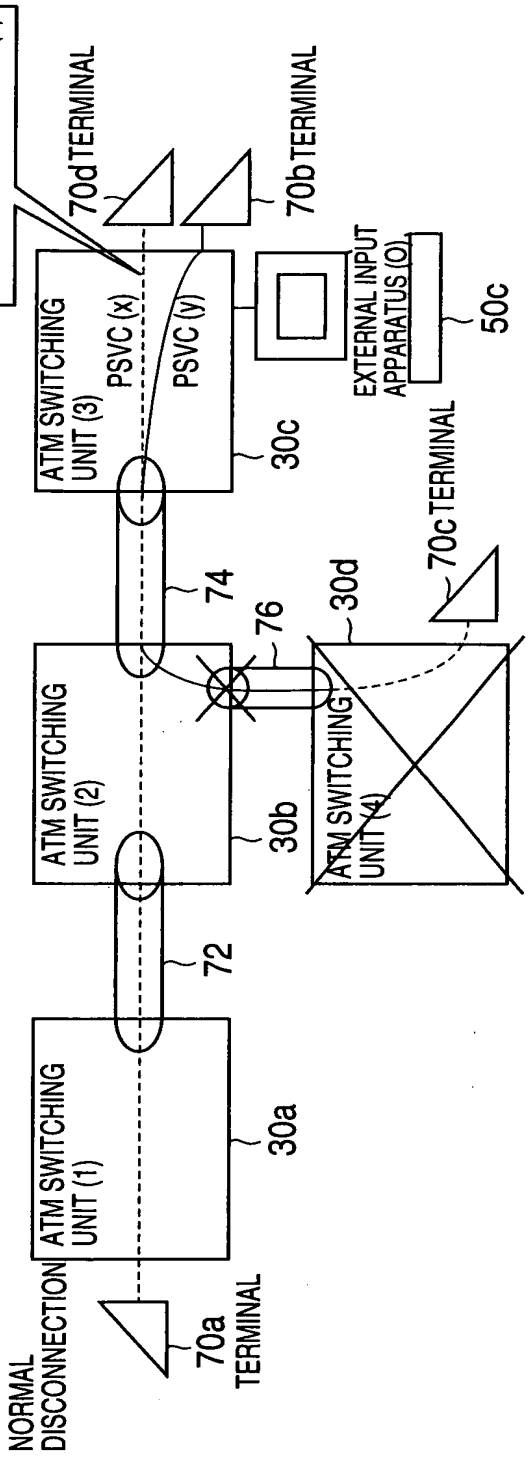

RELEASE ONLY PSVC (x)
NORMAL DISCONNECTION
ATM SWITCHING UNIT (1)
30a
70a TERMINAL
72
ATM SWITCHING UNIT (2)
30b
74
76
ATM SWITCHING UNIT (3)
PSVC (x)
PSVC (y)
30c
70d TERMINAL
70b TERMINAL
EXTERNAL INPUT APPARATUS (O)
50c
ATM SWITCHING UNIT (4)
30d
70c TERMINAL

FIG.29

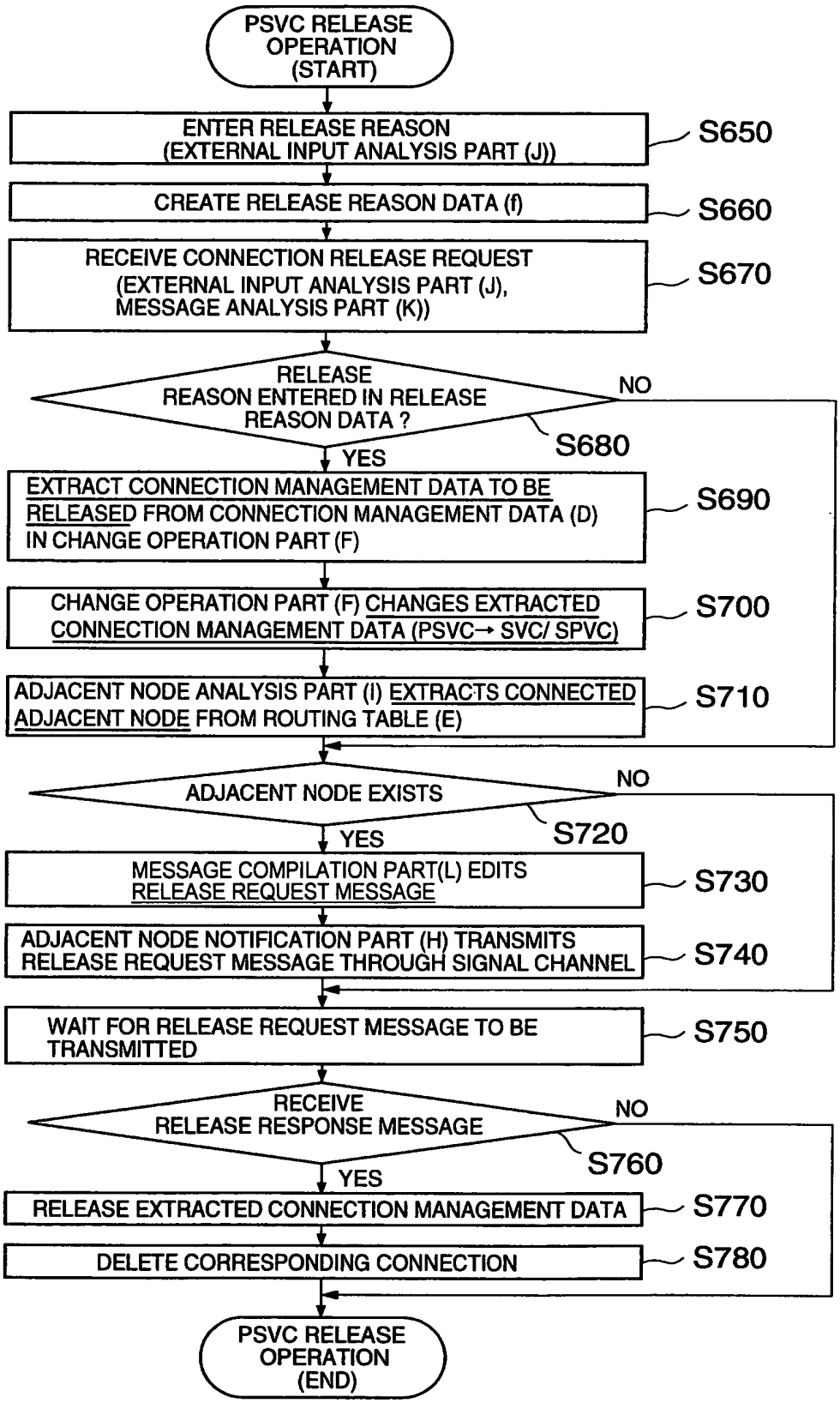
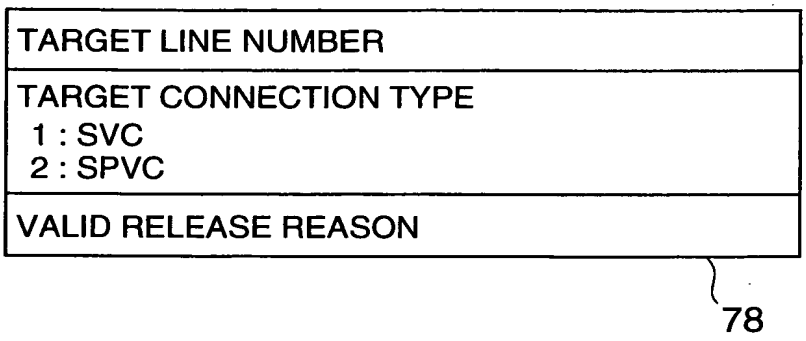

PSVC RELEASE OPERATION (START)
ENTER RELEASE REASON (EXTERNAL INPUT ANALYSIS PART (J))
S650
CREATE RELEASE REASON DATA (f)
S660
RECEIVE CONNECTION RELEASE REQUEST (EXTERNAL INPUT ANALYSIS PART (J), MESSAGE ANALYSIS PART (K))
S670
RELEASE REASON ENTERED IN RELEASE REASON DATA ?
NO
S680
YES
EXTRACT CONNECTION MANAGEMENT DATA TO BE RELEASED FROM CONNECTION MANAGEMENT DATA (D) IN CHANGE OPERATION PART (F)
S690
CHANGE OPERATION PART (F) CHANGES EXTRACTED CONNECTION MANAGEMENT DATA (PSVC→ SVC/ SPVC)
S700
ADJACENT NODE ANALYSIS PART (I) EXTRACTS CONNECTED ADJACENT NODE FROM ROUTING TABLE (E)
S710
ADJACENT NODE EXISTS
NO
S720
YES
MESSAGE COMPILATION PART(L) EDITS RELEASE REQUEST MESSAGE
S730
ADJACENT NODE NOTIFICATION PART (H) TRANSMITS RELEASE REQUEST MESSAGE THROUGH SIGNAL CHANNEL
S740
WAIT FOR RELEASE REQUEST MESSAGE TO BE TRANSMITTED
S750
RECEIVE RELEASE RESPONSE MESSAGE
NO
S760
YES
RELEASE EXTRACTED CONNECTION MANAGEMENT DATA
S770
DELETE CORRESPONDING CONNECTION
S780
PSVC RELEASE OPERATION (END)

FIG.30


TARGET LINE NUMBER
TARGET CONNECTION TYPE
1 : SVC
2 : SPVC
VALID RELEASE REASON
78